This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

LANE MEDICAL LIBRARY STANFORD
P45 .S65 1872 STOR
A treatise on the diseases of infancy an
24503435437

7598

37B

LANE

MEDICAL LIBRARY

SEAL OF THE LELAND STANFORD JUNIOR UNIVERSITY
SEMPER VIRENS
1885

LEVI COOPER LANE FUND

DISEASES

OF

INFANCY AND CHILDHOOD.

A TREATISE

ON THE

DISEASES

OF

INFANCY AND CHILDHOOD.

SECOND EDITION,

ENLARGED AND THOROUGHLY REVISED.

BY

J. LEWIS SMITH, M.D.,

CURATOR TO THE NURSERY AND CHILD'S HOSPITAL, NEW YORK; PHYSICIAN TO THE INFANTS' HOSPITAL, WARD'S ISLAND; CONSULTING PHYSICIAN IN THE CLASS OF CHILDREN'S DISEASES, OUT-DOOR DEPARTMENT OF BELLEVUE HOSPITAL; CLINICAL LECTURER ON DISEASES OF CHILDREN, AND PROFESSOR IN BELLEVUE HOSPITAL MEDICAL COLLEGE, NEW YORK.

LANE MEDICAL LIBRARY
16648
SAN FRANCISCO

PROSUNT QUE OMNIBUS

THE PROPERTY OF THE

PHILADELPHIA:
HENRY C. LEA.
1872.

Entered according to Act of Congress, in the year 1872, by

HENRY C. LEA,

in the Office of the Librarian of Congress, at Washington. All rights reserved.

PHILADELPHIA:
COLLINS, PRINTER.

872

PREFACE TO THE SECOND EDITION.

THE purpose of the author has been to present a description of the diseases of infancy and childhood succinctly, but at the same time in a sufficiently comprehensive manner to meet the requirements of the medical student and practitioner. He has endeavored to incorporate in the treatise all recently ascertained facts relating to this branch of medical practice, and especially has it been his endeavor to recommend such modes of treatment as comport with and are suggested by our present knowledge of the pathology of early life, the efficacy of hygienic measures in the treatment of the young, and the recuperative powers of the system at this age.

While the author has respected the opinions of previous writers, and has adopted them, so far as they appeared to be correct, he has depended much more for the material of his treatise on clinical observations and the inspection of the cadaver. Necessarily, as a result of independent investigations, opinions are now and then expressed different from those which are commonly accepted. Novel views have not, however, been presented, unless the author was fully satisfied that they were substantiated by a sufficient number of observations.

In presenting to the profession the second edition of his work, the author gratefully acknowledges the favorable reception accorded to the first. He has endeavored to merit a continuance of this approbation by rendering the volume much more complete than before. Nearly twenty additional diseases have been treated of, among which may be named Diseases Incidental to Birth, Rachitis, Tuberculosis, Scrofula, Intermittent, Remittent, and Typhoid Fevers, Chorea, and the various forms of Paralysis. Many new formulæ, which experience has shown to be useful, have been introduced, portions of the text of a less practical nature have been condensed, and other portions, especially those relating to pathological histology, have been rewritten to correspond with recent discoveries. Every effort has been made, however, to avoid an undue enlargement of the volume, but, notwithstanding this, and an increase in the size of the page, the number of pages has been enlarged by more than one hundred.

227 West 49th Street, New York,
April, 1872.

CONTENTS.

PART I.

CHAPTER I.

PAGE
INFANCY AND CHILDHOOD 17

CHAPTER II.

CARE OF THE MOTHER IN PREGNANCY 20

CHAPTER III.

MORTALITY OF EARLY LIFE—ITS CAUSES AND PREVENTION . . . 23

CHAPTER IV.

LACTATION 28

Hindrances to Lactation, and physical conditions rendering it Improper—Facts and Rules in reference to Lactation—Human Milk—Modifications of the Milk in consequence of the Diet—Modification of Milk from its retention in the Breast—Modification of Milk from Age and Nervous Impressions—Modification of Milk by the Catamenial Function and Pregnancy—Quantity of Breast Milk required by the Infant—Differences in Suckling Women as regards Quantity and Quality of Milk—Scantiness of Milk; its Causes and Treatment.

CHAPTER V.

SELECTION OF A WET-NURSE 49

CHAPTER VI.

COURSE OF LACTATION—WEANING 54

CHAPTER VII.

ARTIFICIAL FEEDING 57

Composition of milk.

CHAPTER VIII.

BATHS—CLOTHING 60

CHAPTER IX.

PAGE

Accidents and Ailments incidental to the Birth of the Infant, and Detachment of the Cord 63
Apnœa (Asphyxia) Neonatorum—Causes—Treatment—Caput Succedaneum—Cephalæmatoma.

CHAPTER X.

Conjunctivitis of the New Born 65
Causes—Symptoms—Treatment.

CHAPTER XI.

Diseases of the Umbilicus 69
Inflammation of the Umbilical Vein and Arteries—Treatment—Inflammation and Ulceration of Umbilicus—Treatment—Umbilical Granulations or Fungus—Treatment.

CHAPTER XII.

Umbilical Hemorrhage 72
Sex, Age—Causes—Symptoms—Prognosis—Treatment.

CHAPTER XIII.

Diagnosis of Infantile Diseases 76
General Observations—Features, External Appearance of Head, Trunk, and Limbs in Disease—Attitude—Movements—The Voice—Respiratory System—Respiration in Health—Respiration in Disease—Circulatory System—Pulse in Health—Pulse in Disease—Animal Heat—Digestive System—Nervous System, Pain.

PART II.

CONSTITUTIONAL DISEASES.

SECTION I.

DIATHETIC DISEASES.

CHAPTER I.

Rachitis 91
Age—Anatomical Characters—Craniotabes—Symptoms—Complications—Diagnosis—Prognosis—Treatment.

CHAPTER II.

Scrofula 104
Causes—Anatomical Characters—Symptoms—Relation of Scrofula to Tuberculosis—Prognosis—Treatment: Prophylactic; Curative.

CHAPTER III.

PAGE
TUBERCULOSIS 122
Etiology—General Anatomical Characters of Tuberculosis—Anatomical Characters in Infancy and Childhood—Lungs—Abdominal Viscera—Stomach and Intestines—Symptoms—Bronchial Glands—Physical Signs—Lungs—Pleura—Stomach and Intestines—Prognosis—Treatment: Prophylactic; Curative.

CHAPTER IV.

SYPHILIS 149
Etiology—Clinical History—Manifestations—Coryza—Mucous Patches—Roseola—Pemphigus—Acne, Impetigo, and Ecthyma—Visceral Lesions—Prognosis—Treatment.

SECTION II.

ERUPTIVE FEVERS.

CHAPTER I.

MEASLES 159
Symptoms—Complications: Capillary Bronchitis, True Croup, Pneumonitis—Anatomical Characters—Nature—Diagnosis—Prognosis—Treatment.

CHAPTER II.

SCARLET FEVER 169
Symptoms, Regular Form; Irregular Form; Malignant Form—Complications: Gangrene of Mouth, Articular Rheumatism, Serous Inflammation—Sequelæ: Nephritis, Otorrhœa—A Case—Anatomical Characters—Nature—Diagnosis—Prognosis—Treatment—Prophylaxis.

CHAPTER III.

VARIOLA—VARIOLOID 201
Incubative Period—Stage of Invasion—Stage of Eruption—Stage of Desiccation—Desquamation—Varioloid—Mode of Death—Anatomical Characters—Complications—Prognosis—Diagnosis—Treatment.

CHAPTER IV.

VACCINIA 213
History of Vaccination—Appearances, Symptoms, Anomalies, Complications, and Sequelæ—Subsequent Vaccinations—Protection from Vaccination—Revaccination—Selection of Virus.

CHAPTER V.

VARICELLA 224
Incubative Period—Symptoms—Diagnosis—Prognosis—Treatment.

SECTION III.

NON-ERUPTIVE CONTAGIOUS DISEASES.

CHAPTER I.

PAGE

DIPHTHERIA 227
Anatomical Characters — Symptoms—Nature—Sequelæ—Prognosis—Diagnosis—Treatment.

CHAPTER II.

PERTUSSIS 247
Symptoms—Complications—Convulsions—Bronchitis—Pneumonitis—Thrombosis—Diagnosis—Prognosis—Treatment.

CHAPTER III.

PAROTIDITIS 261
Nature—Diagnosis—Treatment.

SECTION IV.

OTHER GENERAL DISEASES.

CHAPTER I.

INTERMITTENT FEVER 263
Symptoms—Prognosis—Treatment.

CHAPTER II.

REMITTENT FEVER 267
Symptoms—Diagnosis—Treatment.

CHAPTER III.

TYPHOID FEVER 269
Causes—Anatomical Characters—Symptoms—Complications—Diagnosis—Duration—Prognosis—Treatment.

CHAPTER IV.

ACUTE RHEUMATISM 277
Causes—Symptoms—Duration—Prognosis—Diagnosis—Treatment.

CHAPTER V.

ERYSIPELAS 284
Table of Cases—Age—Point of Commencement—Causes—Premonitory Symptoms—Symptoms — Prognosis — Duration—Modes of Death — Pathological Anatomy—Treatment.

PART III.

LOCAL DISEASES.

SECTION I.

PAGE

DISEASES OF THE CEREBRO-SPINAL SYSTEM . . 295

CHAPTER I.

ACEPHALUS—ANENCEPHALUS 298
Anatomical Characters—Symptoms—Prognosis.

CHAPTER II.

IMPERFECT BRAIN 299
A Case—Symptoms—Prognosis—Microcephalus—Atrophy of brain.

CHAPTER III.

HYPERTROPHY OF BRAIN 302
Pathological Anatomy—Causes—Cretinism—Symptoms—A Case—Diagnosis—Prognosis—Treatment.

CHAPTER IV.

THROMBOSIS IN THE CRANIAL SINUSES (PHLEBITIS) 308
Anatomical Characters—Causes; from Otitis—Symptoms—Diagnosis—Prognosis—Treatment.

CHAPTER V.

CONGESTION OF BRAIN 314
Active and Passive—Causes—Symptoms—Anatomical Characters—Prognosis—Treatment.

CHAPTER VI.

INTRA-CRANIAL HEMORRHAGE (MENINGEAL HEMORRHAGE—CEREBRAL HEMORRHAGE) 319
Causes—Anatomical Characters—Symptoms—Diagnosis—Prognosis—Treatment.

CHAPTER VII.

CONGENITAL HYDROCEPHALUS 330
Anatomical Characters—Symptoms—Diagnosis—Prognosis—Treatment.

CHAPTER VIII.

ACQUIRED HYDROCEPHALUS 338
Causes—Anatomical Characters—Location and Quantity of Fluid—Symptoms—Prognosis—Treatment.

CHAPTER IX.

PAGE

MENINGITIS, SIMPLE AND TUBERCULAR 341
Age—Anatomical Characters—Causes—Premonitory Stage—Symptoms—A Case—Diagnosis—Prognosis—Treatment.

CHAPTER X.

SPURIOUS HYDROCEPHALUS 363
Anatomical Characters—Symptoms—Cases—Diagnosis—Prognosis—Treatment.

CHAPTER XI.

ECLAMPSIA 369
Essential, Symptomatic, Sympathetic, General, and Partial—Causes—Premonitory Stage—Symptoms—Anatomical Characters—Diagnosis—Prognosis—Treatment.

CHAPTER XII.

TETANUS INFANTUM 382
Table of Cases—Period of Commencement—Frequency in Certain Localities—Causes—Symptoms—Prognosis—Mode of Death—Duration in Fatal Cases—Duration in Favorable Cases—Diagnosis—Preventive Treatment—Treatment.

CHAPTER XIII.

INTERNAL CONVULSIONS 405
Different Forms—Causes—Anatomical Characters—Symptoms—Case—Diagnosis—Prognosis—Modes of Death—Treatment.

CHAPTER XIV.

CHOREA 415
Age—Causes—Sex—Uterine Irritation—Anæmia—Rheumatism—Fright—Imitation—Intestinal Irritation—Lesions of Brain and Spinal Cord—Anatomical Characters—Symptoms—Prognosis—Course—Diagnosis—Treatment: Regimenal; Medicinal.

CHAPTER XV.

INFANTILE PARALYSIS 431
Symptoms—Progress—Etiology—Anatomical Characters—Diagnosis—Prognosis—Treatment.

CHAPTER XVI.

FACIAL PARALYSIS 440
Causes—Symptoms—Prognosis—Treatment. Paralysis with Apparent Hypertrophy: Symptoms—Anatomical Characters—Causes—Prognosis—Treatment.

SECTION II.

DISEASES OF THE RESPIRATORY SYSTEM.

CHAPTER I.

PAGE

CORYZA 445

Causes—Anatomical Characters—Symptoms—Prognosis—Treatment.

CHAPTER II.

SIMPLE LARYNGITIS 449

Symptoms — Chronic Form—Anatomical Characters — Treatment. Spasmodic Laryngitis: Causes—Symptoms—Anatomical Characters—Pathology—Diagnosis—Prognosis—Treatment.

CHAPTER III.

PSEUDO-MEMBRANOUS LARYNGITIS 458

Causes—Anatomical Characters—Symptoms—Pathology—Diagnosis—Prognosis—Treatment—Tracheotomy.

CHAPTER IV.

BRONCHITIS 477

Causes—Anatomical Characters—Symptoms—Capillary Bronchitis—Diagnosis—Prognosis—Treatment.

CHAPTER V.

PNEUMONITIS 490

Catarrhal, Croupous, and Interstitial—Causes—Hypostasis—Anatomical Characters—Cheesy Pneumonitis—Symptoms—Physical Signs—Diagnosis—Prognosis—Treatment.

CHAPTER VI.

PLEURITIS 507

Causes — Cases — Anatomical Characters — Empyema — Symptoms—Physical Signs—Case—Diagnosis—Prognosis—Treatment—Thoracentesis.

SECTION III.

DISEASES OF THE DIGESTIVE APPARATUS.

CHAPTER I.

SIMPLE STOMATITIS; ULCEROUS STOMATITIS; FOLLICULAR STOMATITIS . 525

Simple or Erythematic Stomatitis: Causes—Symptoms—Appearances—Treatment. Ulcerous Stomatitis: Anatomical Characters—Causes—Symptoms—Diagnosis—Prognosis—Treatment. Follicular Stoma- [illegible]ical Characters—Causes—Symptoms—Diagnosis—Prog-

CHAPTER II.

PAGE

THRUSH 533

Anatomical Characters—Description of the Oidium Albicans—Symptoms—Causes—Diagnosis—Prognosis—Treatment.

CHAPTER III.

GANGRENE OF THE MOUTH 538

Anatomical Characters—Age—Causes—Symptoms—Diagnosis—Prognosis—Treatment.

CHAPTER IV.

DENTITION 546

Pathological Results of Dentition—Diagnosis—Treatment—Scarification of the Gums—Second Dentition.

CHAPTER V.

SIMPLE PHARYNGITIS; PERI-PHARYNGEAL ABSCESS; ŒSOPHAGITIS . . 555

Pharyngitis: Anatomical Characters—Causes—Symptoms—Prognosis—Diagnosis—Treatment. Peri-Pharyngeal Abscess: Age—Cause—Anatomical Characters—Symptoms—Duration—Diagnosis—Prognosis—Treatment. Œsophagitis: Anatomical Characters—Treatment.

CHAPTER VI.

INDIGESTION; CONGESTION OF STOMACH; GASTRITIS; FOLLICULAR GASTRITIS; DIPHTHERITIC GASTRITIS; POST-MORTEM DIGESTION; SOFTENING 567

Indigestion: Causes—Symptoms—Prognosis—Treatment. Congestion of the Stomach.. Gastritis: Causes—Age—Symptoms—Anatomical Characters—Diagnosis—Prognosis—Treatment. Follicular Gastritis; Diphtheritic Gastritis; Post-Mortem Digestion; Gelatinous Softening; White Softening.

CHAPTER VII.

DIARRHŒA 585

Non-Inflammatory Diarrhœa: Causes—Symptoms—Anatomical Characters—Diagnosis—Prognosis—Treatment.

CHAPTER VIII.

INTESTINAL INFLAMMATION OF INFANCY 593

Causes—Age—Symptoms—Microscopic Character of the Stools—Pulse—Anatomical Characters—Condition of the Liver—State of the Brain—Diagnosis—Prognosis—Treatment, Regimenal Measures, Medicinal Treatment; Enemata, External Treatment.

CHAPTER IX.

ENTERITIS AND COLITIS IN CHILDHOOD 620

Causes—Symptoms—Diagnosis—Prognosis—Treatment.

CHAPTER X.

PAGE

CHOLERA INFANTUM 624

Definition of the Term—Causes—Its Prevalence in the Cities—Symptoms—Anatomical Characters—Diagnosis—Prognosis—Treatment.

CHAPTER XI.

INTESTINAL WORMS 633

Five Kinds—Description of them—Causes—Symptoms of Lumbrici—Diagnosis—Prognosis—Treatment—Use of Santonin, Spigelia, Chenopodium.

CHAPTER XII.

GASTRO-INTESTINAL HEMORRHAGE 646

Three Varieties—Causes—Prognosis—Treatment.

CHAPTER XIII.

INTUSSUSCEPTION 653

Intussusception without Symptoms—Intussusception with Symptoms—Previous Health—Causes—Age—Seat and Pathological Anatomy—Intussusception in the Small Intestines—Cases—Intussusception in the Large Intestines — Symptoms — Diagnosis — Duration— Prognosis — Mode of Death—Treatment.

SECTION IV.

DISEASES OF THE CIRCULATORY SYSTEM.

CHAPTER I.

CYANOSIS 674

Literature of Cyanosis—Sex—Causes of the Malformation—Symptoms — Prognosis — Mode of Death — Modes of Compensation—Morbid Anatomy—Theories Relating to the Etiology of Cyanosis—Treatment.

SECTION V.

SKIN DISEASES.

CHAPTER I.

ERYTHEMATOUS DISEASES 695

Erythema: Two Forms; Idiopathic, Symptomatic—Prognosis—Diagnosis—Treatment. Roseola: Symptoms—Causes—Prognosis—Diagnosis—Treatment. Urticaria: Causes—Prognosis—Diagnosis—Treatment.

CHAPTER II.

PAPULAR DISEASES 702

Lichen—Prurigo—Strophulus—Treatment.

CHAPTER III.

PAGE

ECZEMA AND SCABIES 704
Eczema; Simplex, Rubrum, and Impetiginodes—Symptoms—Diagnosis—Treatment: General; Local. Scabies: Diagnosis—Treatment.

APPENDIX.

A.—DIETARY FORMULÆ 714
Falkland's Method of Preparing Milk for Infants—Lobb's Method—Meigs' Preparation—Liebig's Soup—Hassell's Comments—Raw Meat—Beef-tea—Liebig's Beef-tea—Hogarth's Essence of Meat—Routh's Comments.

B.—REMARKS ON THE PREVENTION OF SCARLET FEVER. By Wm. Budd, M.D. 720

C.—REMARKS ON THE DIPHTHERITIC MEMBRANE. By Dr. Edward Rindfleisch 725

E.—OBSERVATIONS ON THE STATE OF THE LIVER IN INFANTILE ENTERO-COLITIS 726

F.—CASES OF INTUSSUSCEPTION 728
In the Small Intestines—Intussusception of Ileum into Colon—Invagination of the Cœcum, Ileum and Cœcum, or Ileum, Cœcum, and Colon—Uncertain.

PROPERTY
OF [illegible]
[illegible]

DISEASES OF CHILDREN.

PART I.

CHAPTER I.

INFANCY AND CHILDHOOD.

INFANCY and childhood are in certain respects the most important and interesting periods of life. To the physiologist they are especially interesting, because they are the periods of development and of greatest functional activity; to the pathologist, because in them many diseases occur which are rarely or never observed in the other periods, or which present in these periods peculiar features; to the physician and vital statistician, because in them there is the greatest amount of sickness, and largest number of deaths.

INFANCY extends from birth to the age of two and a half years, or till the completion of first dentition. In infancy the organs are delicately organized, containing a large proportion of water, and hence are easily injured. In this period the brain is rapidly developed—more so than any other organ; animal matter predominates in the bones; the arteries are relatively large, the muscles small; the superficial veins are small. Fat is absent from the interior of the body, but abundant, in well-nourished infants, underneath the integument. The skin is delicate, and its temperature not much below that of the blood. At birth it has a reddish hue, and is covered with soft fine hairs (lanugo). The reddish hue gradually fades into the healthy tint of infancy, and the hairs fall out. In the first two months the sweat glands have little functional activity, sensible perspiration being quite rare. Subsequently perspiration is freer, and in certain diseased states is abundant (rachitis, etc.). The sebaceous glands in the first half of infancy are active, particularly upon the scalp, producing often a pale yellow incrustation, consisting of sebaceous matter and epidermic cells.

The secretions from the mucous surfaces commence at an early period. At birth the surface of the digestive tube is covered with more or less mucus, often in considerable quantity. The meconium is not considered, as formerly, to be a product of intestinal secretion. It consists of flat epithelial cells, fine hairs, oil globules, crystals of cholesterine, and brownish or yellowish masses of coloring matter, probably from the liver. It is supposed that, with the exception of the coloring matter, the meconium is derived mainly from the amniotic fluid which the fœtus has swallowed.

The most wonderful change occurring in the system at birth, through the exigencies of the new life, is that in the circulation. The flow of blood being interrupted, thrombi form in the umbilical vein, and arteries, and in the ductus arteriosus, and ductus venosus, and these vessels gradually atrophy, becoming finally shrivelled but permanent cords. I have many times at autopsies removed the plug from the ductus arteriosus when death had occurred as late as the third week. The foramen ovale closes slowly. I have ordinarily found it open till near the end of the first half year, but the valve closes fully the aperture, so that there is no detriment to the circulation. Both the pulse and respiration are more frequent during infancy than childhood, and are more readily accelerated by moral and physical causes.

The stomach is less elongated, and emesis more readily produced than in the adult. The liver is large, occupying at birth nearly half of the abdominal cavity, but growing smaller in successive months. The appetite is good and digestion active, so that hunger when appeased, soon returns. The thymus gland, at birth about the size of an unexpanded lung, slowly atrophies, but it does not totally disappear till after infancy.

The kidneys, distinctly lobulated at birth, gradually change their form, so as to present in the last part of infancy nearly the shape of the organ in the adult. The renal secretion commences early, even before birth. The kidneys seldom undergo degenerative changes as in the adult, but they are liable to congestions and inflammations. During the first month, and especially the first fortnight, crystals of uric acid, and the urates, are often found in the urine, in a state of apparent health, causing more or less fretfulness in their elimination, staining the diaper, and not infrequently being arrested in the tubules of the pyramids, where they can be seen as pink-colored spots or lines (uric acid infarction). These deposits of uric acid and the urates may even occur in the fœtus, producing obstruction and inflammation of the renal tubes. Congenital cystic degeneration of the kidneys is, in the opinion of Virchow, due to them. In early infancy the senses are imperfectly developed, the eyes being attracted only by bright objects, and the sense of hearing affected only by loud noises. Sleep is the normal state in the first weeks of life; as the age of the infant advances, less and less sleep is required; but the oldest *infants* need more than children, and several hours more than adults.

The new-born infant is apparently destitute of mental faculties. It seeks the breast by instinct, and it exhibits no perception or reflection. The loud cries with which it commences its existence are not from anger or suffering; they appear to be normal, like the act of nursing, and providentially designed in order to expand the lungs. It is not till the close, or near the close, of the first month, that the gray substance of the brain begins to appear—the probable seat of the mind, and the source of all mental phenomena. Perception and curiosity are early manifested. The infant, as Edmund Burke has remarked, is constantly seeking new objects for its amusement, rejecting old playthings for such as possess more novelty. Reflection, a higher faculty of the mind, appears at a later period. The mind and the bodily organs in infancy are, in a high degree, impressionable. Anger is excited by trivial causes, but is easily appeased; and the various functions in the system are disturbed by agencies which in youth or manhood would have no appreciable effect.

CHILDHOOD extends from infancy to the age of fifteen years or puberty. It is a period of great physical activity, and of rapid growth. The functions of the various organs are performed with more moderation than in infancy, and are less frequently deranged. The volume of the brain continues to increase rapidly, and it becomes firmer than in infancy. It is estimated that by the seventh year the weight of this organ has doubled. The mind now exerts a controlling influence over the actions of the individual. The digestive organs have changed, so that solid food is required. Most of the glandular organs are less active than in the greater part of infancy, and some of them, as the liver, are relatively smaller. The pulse and respiration gradually become less frequent as the child advances in age.

CHAPTER II.

CARE OF THE MOTHER IN PREGNANCY.

The frequency of miscarriages and still-births, and the large number of ill-formed and puny infants, born to a precarious and short existence, render imperative, on the part of the mother, a strict observance of the laws of health, and an avoidance of all exciting or perturbating influences during the time when the fœtus is being developed. The diet should be plain and easily digested, but nutritious. There is often a craving in pregnancy for unusual articles of food. These may sometimes be allowed within certain limits, provided they are such as do not derange the stomach. Meats and animal broths, together with vegetables and farinaceous food, should constitute the ordinary diet, and should be taken at regular intervals.

Daily exercise, never violent, but moderate and gentle, is requisite. No exercise is better, none safer and more likely to contribute to cheerfulness and healthy functional activity of the organs, than the ordinary household duties. Lifting heavy weights, or work which, like washing and ironing, causes great and continued action of the abdominal muscles, should be avoided. Such exercise is highly injurious, and is apt to produce premature labor. Exercise in the open air, on foot or by an easy conveyance, conduces to the health of the mother, and the growth and development of the fœtus. On the other hand, rapid riding over rough roads is one of the most dangerous modes of exercise. It has been known to destroy the fœtus, which up to that time had been apparently vigorous. When such a result occurs, there is probably more or less detachment of the placenta.

It being a matter of the utmost importance that the health of the mother should continue good during gestation, any disease which she may have in this period, and which affects her nutrition or the character of her blood, should be promptly cured if practicable, and with the least possible reduction of the vital powers. Intermittent fever, occurring during gestation, should never be allowed to continue. It seriously retards fœtal development, and may produce miscarriage. Unless it is controlled by proper measures, the offspring, though born at term, is puny and emaciated. Syphilis, in the pregnant woman, also requires treatment. This disease, readily transmitted from the mother to the fœtus through the ovum or the uterine circulation, may be eradicated by anti-syphilitic treatment of the mother, or at least so modified that the infant is born vigorous and healthy.

The pregnant woman should avoid all causes of undue mental excitement. This is almost as necessary as the avoidance of great physical exertion. There is, during pregnancy, unusual susceptibility to mental impressions, and this should be borne in mind not only by the woman herself, but by those who associate with her.

Strong emotions, whether of joy, sorrow, or anger, affect primarily the nervous system, but indirectly most of the organs of the body. Observations have long established the fact, that such emotions influence the state and functions not only of the digestive and glandular, but muscular organs, as the heart and uterus. Physicians are familiar with cases in which vivid mental impressions produced uterine contractions, and even miscarriage, or have disturbed the catamenial function. Therefore, the associations and cares of pregnant women should be such as conduce to cheerfulness and equanimity.

It is the popular belief, and the belief of many physicians, that vivid mental impressions sometimes have a direct effect on the development of the fœtus. Many cases are on record in which infants were born with marks or deformities, corresponding in character with objects which had been seen and had made a strong impression on the maternal mind at some period of gestation. Whether the mind of the mother exerts a controlling influence on the form and color of the fœtus, is a subject of great interest to the psychologist as well as physiologist and physician, since it involves no less a question than the power and scope of the human mind. Violent emotions, it is admitted, may affect directly most of the important organs in the system. They may derange the liver, causing jaundice, accelerate, or for a moment suspend the heart's action, stimulate the kidneys, causing diuresis, or even the intestinal follicles, causing watery evacuations. But with all these organs the brain is connected by nerves which anatomy reveals. On the other hand, the mother and fœtus have a distinct existence as regards their nervous systems, and even their blood. Still, the multitude of facts which have accumulated justify the belief that deformity or other abnormal development of the fœtus is, sometimes, due to the emotions of the mother. Some of the cases related by Dr. Whitehead, in his work on hereditary diseases, are very striking and difficult to explain, on the ground of coincidence. I have met the following cases. An Irish woman of strong emotions and superstitions was passing along a street in the first months of her gestation, when she was accosted by a beggar, who raised her hand, destitute of thumb and fingers, and in "God's name" asked for alms. The woman passed on: but reflecting in whose name money was asked, felt that she had committed a great sin in refusing assistance. She returned to the place where she had met the beggar, and on different days, but never afterwards saw her. Harassed by the thought of her imaginary sin, so that for weeks, according to her statement, she was made wretched by it, she approached her confinement. A female infant was born, otherwise perfect, but lacking the fingers and thumb of one hand. The deformed limb was on the same side, and it seemed to the mother to resemble precisely that of the beggar. In another case which I met, a very similar malformation was attributed by the mother of the child to an accident occurring to a near relative, which necessitated amputation during the time of her gestation. I examined both of these children with defective limbs, and have no doubt of the truthfulness of the parents. In May, 1868, I removed a supernumerary thumb from an infant, whose mother, a baker's wife, gave me the following history: No one of the family, and no ancestor, to her knowledge, presented this deformity. In the early months of her gestation she sold bread from the counter, and nearly every day a child with double thumb came in for a penny roll, presenting the penny between the thumb and the finger. After the third month she left the bakery, but the malformation was so impressed upon her mind, that she was not surprised to see it reproduced in her infant.

Professor William A. Hammond, of this city, in an interesting paper on the "Influence of the Maternal Mind," etc. (*Quarterly Journal of Psychological Medicine*, January, 1868), says: "The chances of these instances, and others, which I have mentioned, being due to coincidence, are infinitesimally small, and though I am careful not to reason upon the principle of POST HOC, ERGO PROPTER HOC, I cannot, nor do I think any other person can, no matter how logical may be his mind, reason fairly against the connection of cause and effect in such cases. The correctness of the facts can only be questioned; if these be accepted, the probabilities are thousands of millions to one, that the relation between the phenomena is direct." Professor Dalton also says (*Human Physiology*), "there is now little room for doubt that various deformities and deficiencies of the fœtus, conformably to the popular belief, do really originate in certain cases from nervous impressions, such as disgust, fear, or anger, experienced by the mother." The observations on which this belief is based relate both to man and the lower animals. A very strong argument in its support is, as Professor Hammond remarks, the popular opinion, which dates back to the time of Jacob (Genesis xxx.). An almost universal sentiment, running through centuries, is rarely wholly fallacious. It has some truth for its foundation, especially when, as in this instance, the subject is one of observation.

If maternal emotions affect the development of the exterior of the fœtus, as observations show, and physiologists admit, the presumption is strong, that they may affect also the proper development, and adjustment of the parts of the brain, an organ so complex and delicate, and may therefore give rise to idiocy. Dr. Seguin (*Idiocy and its Treatment, etc.*, New York, 1866) thus remarks on this point: "Impressions will, sometimes, reach the fœtus, in its recess, cut off its legs or arms, or inflict large flesh wounds, before birth, . . . from which we surmise that idiocy holds unknown though certain relations to maternal impressions, as modifications to placental nutrition."

In view of such important facts, the duty of the pregnant woman is rendered the more imperative to avoid the presence of disagreeable and unsightly objects, as well as all causes of excitement, and to remove, as soon as possible, vivid and unpleasant impressions, by quiet diversion of the mind.

CHAPTER III.

MORTALITY OF EARLY LIFE—ITS CAUSES AND PREVENTION.

No fact is better known in the profession, than that the first years of life constitute the period of greatest mortality.

In England, where there is an accurate registration of births and deaths, statistics show fifteen deaths in every hundred infants in the first year of life, and between four and five deaths in the first deformity or other abnormal development of the fœtus is, sometimes, due to the emotions of the mother. Some of the cases related by Dr. Whitehead, in his work on hereditary diseases, are very striking and difficult to explain, on the ground of coincidence. I have met the following cases. An Irish woman of strong emotions and superstitions was passing along a street in the first months of her gestation, when she was accosted by a beggar, who raised her hand, destitute of thumb and fingers, and in "God's name" asked for alms. The woman passed on: but reflecting in whose name money was asked, felt that she had committed a great sin in refusing assistance. She returned to the place where she had met the beggar, and on different days, but never afterwards saw her. Harassed by the thought of her imaginary sin, so that for weeks, according to her statement, she was made wretched by it, she approached her confinement. A female infant was born, otherwise perfect, but lacking the fingers and thumb of one hand. The deformed limb was on the same side, and it seemed to the mother to resemble precisely that of the beggar. In another case which I met, a very similar malformation was attributed by the mother of the child to an accident occurring to a near relative, which necessitated amputation during the time of her gestation. I examined both of these children with defective limbs, and have no doubt of the truthfulness of the parents. In May, 1868, I removed a supernumerary thumb from an infant, whose mother, a baker's wife, gave me the following history: No one of the family, and no ancestor, to her knowledge, presented this deformity. In the early months of her gestation she sold bread from the counter, and nearly every day a child with double thumb came in for a penny roll, presenting the penny between the thumb and the finger. After the third month she left the bakery, but the malformation was so impressed upon her mind, that she was not surprised to see it reproduced in her infant.

Professor William A. Hammond, of this city, in an interesting paper on the "Influence of the Maternal Mind," etc. (*Quarterly Journal of Psychological Medicine*, January, 1868), says: "The chances of these instances, and others, which I have mentioned, being due to coincidence, are infinitesimally small, and though I am careful not to reason upon the principle of POST HOC, ERGO PROPTER HOC, I cannot, nor do I think any other person can, no matter how logical may be his mind, reason fairly against the connection of cause and effect in such cases. The correctness of the facts can only be questioned; if these be accepted, the probabilities are thousands of millions to one, that the relation between the phenomena is direct." Professor Dalton also says (*Human Physiology*), "there is now little room for doubt that various deformities and deficiencies of the fœtus, conformably to the popular belief, do really originate in certain cases from nervous impressions, such as disgust, fear, or anger, experienced by the mother." The observations on which this belief is based relate both to man and the lower animals. A very strong argument in its support is, as Professor Hammond remarks, the popular opinion, which dates back to the time of Jacob (Genesis xxx.). An almost universal sentiment, running through centuries, is rarely wholly fallacious. It has some truth for its foundation, especially when, as in this instance, the subject is one of observation.

If maternal emotions affect the development of the exterior of the fœtus, as observations show, and physiologists admit, the presumption is strong, that they may affect also the proper development, and adjustment of the parts of the brain, an organ so complex and delicate, and may therefore give rise to idiocy. Dr. Seguin (*Idiocy and its Treatment, etc.*, New York, 1866) thus remarks on this point: "Impressions will, sometimes, reach the fœtus, in its recess, cut off its legs or arms, or inflict large flesh wounds, before birth, . . . from which we surmise that idiocy holds unknown though certain relations to maternal impressions, as modifications to placental nutrition."

In view of such important facts, the duty of the pregnant woman is rendered the more imperative to avoid the presence of disagreeable and unsightly objects, as well as all causes of excitement, and to remove, as soon as possible, vivid and unpleasant impressions, by quiet diversion of the mind.

CHAPTER III.

MORTALITY OF EARLY LIFE—ITS CAUSES AND PREVENTION.

No fact is better known in the profession, than that the first years of life constitute the period of greatest mortality.

In England, where there is an accurate registration of births and deaths, statistics show fifteen deaths in every hundred infants in the first year of life, and between four and five deaths in the first month. Statistics on the continent correspond with those in England, as regards the periods of greatest mortality. Quételet says, " . . . there die during the first month after birth, four times as many children as during the second month after birth, and almost as many as during the entirety of the two years that follow the first year, although even then the mortality is high. The tables of mortality prove, in fact, that one-tenth of children born, die before the first month has been completed."

In this country, in consequence of deficient registration of births, the percentage of deaths to births cannot be accurately ascertained. In this city, 53 per cent. of the total number of deaths occur under the age of five years, and 26 per cent. under the age of one year. According to the census of 1865, there were in New York city 95,020 children under the age of five years, and during the five years ending with 1865, 49,000 children five years old and under had died. Therefore, according to these statistics, more than one-third of all the infants born in this city die under the age of five years. An error, however, occurs from the fact that, while the death statistics were complete, it is known there were more children in the city than were embraced in the census returns. Still it may, I think, be safely stated that one-fourth of the children born in this city die before the age of five years.

In less crowded cities and the rural districts, it is known that the percentage of deaths in the first years of life to the total number of deaths is considerably less than in New York city, but it is nevertheless large.

As the child advances towards puberty, the liability to sickness and death gradually diminishes, but even the last years of childhood present a considerably larger percentage of deaths to the population than does youth or manhood.

The causes of this great mortality of infants and children, and the means of diminishing it, deserve careful consideration.

Some of the causes which conspire to produce this mortality are in a measure unavoidable. Such are congenital vices of formation of internal organs. Many of the internal malformations necessarily occasion an early death. Cases of anencephalus, most cases of congenital hydrocephalus, of spina bifida, of cyanosis, are fatal before the close of infancy. These defects of formation we cannot detect before birth, and their causes are often obscure. Some of them seem to result from inflammation, believed to be, occasionally, syphilitic, developed at some period of fœtal existence. Other internal malformations are attributable to perturbating influences, operating temporarily on the mother during gestation.. But in a large proportion of cases, we cannot assign the cause. Obviously, only partial success can attend our efforts, as regards prevention in these cases, and almost no success, as regards the use of remedial measures.

Another obvious cause of the great mortality of early life, is natural feebleness of system, especially in infancy. The younger the patient, prior to the middle period of life, the sooner are the vital powers exhausted by disease. Hence a larger proportion of infants succumb to the same malady than children, and a larger proportion of children than adults. This statement is true of infancy and childhood in general. It is a law in nature, and cannot be changed by art. But there are many infants born with hereditary disease, or a strong predisposition to disease, through a fault, which is, in a degree, remediable, in the system of one or both parents, as, for example, the syphilitic, scrofulous, or tubercular diathesis. Parents seriously affected by such diseases cannot, without corrective treatment, have healthy offspring. Their children are among the first to droop and die, either directly from the inherited disease, or from feebleness of constitution, which such disease entails, and which renders them an easy prey to other diseases. The duty of the physician, as regards such parents, is obvious. He may, by therapeutic and hygienic measures, secure a more healthy progeny, and, so far as he can do this, he aids in diminishing the infantile mortality. He may sometimes, by timely measures directed to the infant, establish a better state of health.

The subject of hereditary disease is one of great interest and importance, especially as regards the city population. Inherited affections are less common in the country, but in the city they contribute largely to the number of deaths in early life.

Another important cause of the great mortality of infants and children, is the fact that they are peculiarly liable to certain severe and fatal diseases. The zymotic diseases, which, as a rule, occur but once, are more common at this age than subsequently. Some of these, as scarlet fever, greatly increase the number of deaths. The zymotic diseases are for the most part infectious. Hence they are very prevalent and fatal in cities, where there is much greater intercourse of children than in the country. Scarlet fever is one of the six most fatal diseases in New York city. The prevention of contagious diseases obviously depends, in great measure, on isolation, which it is the duty of the physician to advise. Boards of health, or civil authorities, may also do something as regards the schools, to prevent the spread of these diseases. One of them, the most loathsome and dreaded of all, namely, smallpox, the physician has the power to prevent. Some of the most fatal diseases of life, not contagious, as croup and capillary bronchitis, also occur in infancy and childhood, materially increasing the mortality. These local affections cannot be prevented by the physician, but only by judicious hygienic management on the part of families.

Another obvious and important cause of the mortality of early life, is the anti-hygienic condition or state in which many children live in consequence of the poverty or gross negligence of parents.

Residence in insalubrious localities, personal and domiciliary uncleanliness, exposure without proper protection to vicissitudes of weather, are fertile causes of sickness and death. Hence one reason of the great infantile mortality among the city poor, who live in damp and dark alleys, and in crowded and filthy tenement-houses, breathing night and day an atmosphere loaded with noxious gases. All physicians are aware how the malignant diseases, such as Asiatic cholera, cholera infantum, diphtheria, and typhus fever, seek the quarters of the city poor, and what terrible havoc they make there. All are aware, also, what wonderful recoveries occur when feeble and attenuated infants, gradually sinking with chronic disease, induced in great measure by this malaria, are transferred from such localities to the pure air of the country.

Careless management of young children, as regards dress, increases greatly the liability to local diseases, such as commonly occur from exposure to cold. These are inflammatory affections, seated chiefly upon the mucous surfaces, but sometimes in parenchymatous organs. Adults, aware of the effect of sudden change of temperature from warm to cold, or of exposure to currents of air, protect themselves by additional clothing. Such precautionary measures are often lacking in the management of young children, and hence one cause of their great liability to local affections, both of the respiratory and digestive organs.

Routh, in his excellent treatise on Infant Feeding, says: "Among the most pernicious influences to young children, however, we may include cold. The change of temperature from 45° to 4° or 5° below zero, as before stated, producing an increase of mortality in London alone of three to five hundred. As out of one hundred deaths, however, from all specified causes, nearly twenty-four occur to children under one, and thirty-six to children under five; the great increase of mortality to children by cold, is thus, at once, made obvious. Indeed, it is a household word amongst us, which takes its origin from the Registrar-General's returns, that a very cold week always increases the mortality of the very young and the very aged."

Lastly, a very important cause of mortality in early life is the use of improper food. In infants, artificial feeding in place of the aliment which nature has provided for them, and, in children, the use of innutritious or indigestible articles of diet, give rise to diarrhœal maladies, emaciation, and death in numerous instances. Sometimes, also, defective alimentation is the cause of scrofulous or tuberculous ailments, and sometimes it gives rise to a cachexia or feebleness of system, which, without engendering any positive disease, renders those thus affected less able to support disease induced by other causes. A committee, of which Prof. Austin Flint, Jr., was chairman, appointed in 1867 to revise the "dietary table of the Children's Nurseries on Randall's Island," state, with much truth and force: "Children . . . . are not capable of resisting bad alimentation, either as regards quantity, quality, or variety. At that age the demands of the system for nourishment are in excess of the waste; the extra quantity being required for growth and development. If the proper quantity and variety of food be not provided, full development cannot take place, and the children grow up, if they survive, into puny men and women, incapable of the ordinary amount of labor, and liable to diseases of various kinds. This is frequently illustrated in the higher walks of life, particularly in females; for many suffer through life from improper diet in boarding-schools, due to false and artificial notions of delicacy or refinement. After a certain period of improper and deficient diet in children, the appetite becomes permanently impaired, and the system is rendered incapable of appropriating the amount of matter necessary to proper development and growth."

Improper feeding, like other causes of mortality, is much more injurious, much more frequently the cause of death, in the city than country. Statistics in Europe, as well as this side of the Atlantic, establish this fact. It is in infancy, and especially in the first year, that the use of unwholesome food entails the most serious consequences. No artificially prepared food is a good substitute for the mother's milk, and hence artificial feeding of the infant, unless under the most favorable circumstances, results disastrously. In the country, where salubrious air and sunlight conspire to invigo- the system, and a robust constitution is inherited, and where ilk fresh and of the best quality is readily obtained, lactation is not so necessary for the well-being of the infant; but in the city its importance cannot be too strongly urged.

The foundlings of the cities afford the most striking and convincing proofs of the advantage of lactation. In some cities foundlings are wet-nursed, while in others they are dry-nursed, and the result is always greatly in favor of the former. Thus, on the continent, in Lyons and Parthenay, where foundlings are wet-nursed almost from the time that they are received, the deaths are 33.7 and 35 per cent. On the other hand, in Paris, Rheims, and Aix, where the foundlings are wholly dry-nursed, their deaths are 50.3, 63.9, and 80 per cent.

In this city the foundlings, amounting to several hundred a year, were, till recently, dry-nursed; and, incredible as it may appear, their mortality, with this mode of alimentation, nearly reached 100 per cent. Recently wet-nurses have been employed, for a part of the foundlings, with a much more favorable result.

These facts, to which others might be added from the experience of European cities, show the importance of lactation as a means of reducing infantile mortality in the cities. What has been stated as regards the result of artificial feeding of foundlings, is true, in great measure, in reference to all city infants. The ill effect of artificial feeding is well known in this city, and it is the common practice in families to employ a hired wet-nurse, if, for any reason, the mother's milk is insufficient.

When the infant has reached the age at which it is proper to wean it, the digestive organs are less frequently deranged by errors of diet. More substantial food, and considerable variety in it, may now be not only safely allowed, but are required by the wants of the system. Still, the feeding of children in health, and much more in sickness, is a subject of great importance. Therefore lactation, and the diet of infancy and childhood, will occupy our attention in the following pages.

CHAPTER IV.

LACTATION.

It is desirable that the infant, as soon as it requires nutriment, should receive breast milk. If it is fed, for a few days, with the bottle or spoon, it may be difficult finally to induce it to take the breast; therefore it is well to determine early whether the mother will be able to wet-nurse her infant, so that, if unable, suitable provision may be made.

The matter of determining, beforehand, the capability of the mother for wet-nursing has been investigated by Dr. Donné, of Paris, and in his treatise on Mothers and Infants he describes the mode in which it may be ascertained. The desired information, in his opinion, may be acquired by examining the colostrum, which is secreted in small quantity, in the last months of gestation, and which can be squeezed from the breast in sufficient quantity for inspection.

In some women, according to Dr. Donné, the colostrum is so scanty that only a drop, or half a drop, can be obtained from the nipple by careful pressure. This will be found by the microscope to contain but few milk globules, ill-formed, and a few granular bodies, such as the colostrum ordinarily contains. Such women almost invariably furnish poor milk, and in small quantity. In other women the colostrum is abundant, but thin, resembling gum-water; it lacks the yellow streaks and viscous character of ordinary colostrum, and it flows readily from the nipple. The milk of such women is sometimes scanty, sometimes abundant, but it is watery and deficient in nutritive principles. In a third class of women, the colostrum is pretty abundant, and it contains yellowish streaks, of more or less consistence, which are found to be rich in milk globules, of good size, and without the admixture of mucous globules. Women furnishing such colostrum in the last weeks of gestation will have sufficient milk, and of good quality. These latter women make the best wet-nurses.

Hindrances to Lactation and Physical Conditions Rendering it Improper.

The primipara often experiences difficulty in wet-nursing in consequence of a depressed state of the nipple. It is not sufficiently prominent to be readily grasped by the mouth, and after ineffectual attempts the infant becomes fretful when applied to the breast and, perhaps, for a time refuses it altogether. Multiparæ occasionally experience the same inconvenience, but it is not common when there has once been successful lactation. By calmness and perseverance on the part of the mother, the infant can usually be made to seize the nipple in the course of a week.

Depression of the nipple is, to a certain extent, the result of pressure upon it by the dress during gestation. The state of the nipples should, indeed, in those who have never suckled, receive early attention, even before the birth of the infant. Tightness of dress around the breast, as indeed upon every part of the body, should be avoided, and from time to time gentle traction should be made upon the nipple, if it is depressed. It may be drawn out by the fingers of the mother several times each day, or by a common breast-pump, or by suction with a tobacco-pipe, the edge of the bowl having been smoothed. Occasionally, in these cases of deficient nipple, the mother, fatigued and discouraged by her frequent ineffectual attempts to induce the infant to nurse, becomes feverish and excited, so that the quantity of her milk is sensibly diminished. The physician should assure her, as he usually can with confidence, that in a few days, as the baby becomes a little stronger, there will be no difficulty in its nursing. Some women are unremitting in their endeavors to procure nursing. This should be forbidden, since the lack of sleep, and the nervousness which such constant attention produces, tend to defeat the object which they have in view, by diminishing the secretion of milk. The application of the infant to the breast once in an hour and a half to two hours is quite sufficient. In some cases, when practicable, the aid of another woman, whose infant is a little older, is invaluable. The exchange of infants for a few times may remedy the difficulty.

Occasionally lactation is rendered difficult and painful by too long delay before applying the infant to the breast. When the mother has rested a few hours after her confinement, from three to six in ordinary cases, lactation may commence. There is, at first, but very little milk, often only a few drops, but the secretion is promoted by nursing, so that the requisite amount is sooner obtained than when the infant is kept from the breast till the second or third day. If, as some physicians advise, suckling is deferred till the breasts are full and tender, and if, as is often the case with primiparæ, the nipples are also tender, many mothers lack the fortitude required to allow their infants to obtain a sufficient amount of milk. Excoriated and fissured nipples constitute a serious impediment to lactation. They are very sensitive on pressure, and are long in healing. They are fully described in works which relate to female diseases, and their treatment pointed out. Occasionally fissured nipples do harm to the infant by the blood which escapes and is swallowed with the milk. A case is related in which positive indigestion was caused in this way, the infant vomiting, after each nursing, milk mixed with blood. The local hindrances to lactation described above can, in most instances, be relieved in the course of a few weeks.

There is, occasionally, a constitutional state of the mother which necessitates either the employment of a hired wet-nurse or weaning. This is the case when there is a strong tendency to tuberculosis. If the complexion is pallid, and the system at all emaciated, and suckling is attended by more or less exhaustion, and if with fair trial of wine and tonics there is no improvement, the physician is justified in forbidding farther attempts at wet-nursing. If there is, under such circumstances, an hereditary tendency to tuberculosis, it is his duty to interdict it positively. The opinion of the physician, in such a matter, should be formed after mature deliberation. There are many women who, suffering temporarily from depression, and discouraged, are ready at once to abandon their infants to the care of others, with the least encouragement on the part of the physician to do so, but who, by attention to their own health, and especially by taking more sleep, soon recover from their depression and become good wet-nurses. On the other hand, night-sweats, a cough, and progressive decline in health, show the need of immediate suspension of wet-nursing.

Sometimes women, prior to pregnancy, present indubitable evidence of tuberculosis, but by the improved general health which attends pregnancy, the disease is temporarily arrested. Such women should never suckle their infants. If they do, they soon lose all that was gained, and the disease advances rapidly. These objections to wet-nursing in such a state of health apply to the mother. There are also objections as regards the infant. The milk of those in decidedly infirm health, is deficient in nutritive principles. Their infants, therefore, are ill-nourished, and, if they have inherited a predisposition to tuberculosis, there is great danger that this disease will be developed in them; whereas with healthy wet-nursing, even a strong predisposition may remain latent. M. Donné relates the following instructive cases, which show the danger which sometimes attends suckling, and the imperative necessity which may arise of discontinuing it. "A very light-complexioned young mother, in very good health, and of a good constitution, though somewhat delicate, was nursing for the third time, and as regarded the child successfully. All at once this young woman experienced a feeling of exhaustion. Her skin became constantly hot; there were cough, oppression, night-sweats; her strength visibly declined, and in less than a fortnight she presented the ordinary symptoms of consumption. The nursing was immediately abandoned, and from the moment the secretion of milk had ceased, all the troubles disappeared." "A woman of forty years of age . . . having lost, one after another, several children, all of whom she had put out to nurse, determined to nurse the last one herself. . . . This woman, being vigorous and well-built, was eager for the work, and, filled with devotion and spirit, she gave herself up to the nursing of her child with a sort of fury. At nine months, she still nursed him from fifteen to twenty times a day. Having become extremely emaciated, she fell all at once into a state of weakness, from which nothing could raise her, and two days after the poor woman died of exhaustion."[1]

Constitutional syphilis in the mother does not contra-indicate lactation. It is probable that the infant also has it. The mother should take anti-syphilitic remedies, which will eradicate the disease in herself, and also, if it be present, in the infant. Febrile affections, also, do not in general contra-indicate lactation. They may, however, for a time, diminish the quantity of milk, or impair its quality. If, however, the mother is in a critical state, or much reduced, whatever the disease, suckling should cease. Whether or not the infant should be taken from the breast, if the mother is suffering from one of the essential fevers, depends on the degree of her exhaustion. Twice I have known newly-born infants nurse their mothers through attacks of scarlet fever, without contracting it, but suffering immediately afterwards from severe and protracted eczema. In the country, where artificially-fed infants as a rule do well, it might be best to wean if the mother is affected with such a disease, but in the city eczema is less dangerous than the diarrhœal affections, which early weaning is apt to entail. In most cases of typhus or typhoid, weaning or procuring a wet-nurse is necessary, on account of the depression of the vital powers which this disease produces.

Inflammatory affections, unless of a dangerous character, do not ordinarily interfere with lactation, except that the quantity of milk may be somewhat diminished. In severe inflammation, it may be so necessary to husband the strength, or to keep the patient perfectly quiet, that suckling her infant would be injudicious. It should then be transferred to a wet-nurse or weaned. Inflammation of the breast often presents an impediment to lactation. It is a common and painful affection, suspending, or greatly diminishing the secretion of milk in the affected gland. Nursing should cease as soon as there are evident signs of inflammation, unless it is limited to a small part of the gland. General heat of the breast, tenderness and induration extending over a considerable part of it, are signs which indicate the immediate removal of the infant from it. Lactation must be restricted to the unaffected side. It is often the case that the volume of the inflamed gland is considerably increased from the afflux of blood to it, and from the interstitial exudation, while it contains little or no milk, and attempts at lactation, under such circumstances, are injurious to the mother as well as infant. The cause of the swelling should be explained to the mother, who commonly attributes it to the accumulation of milk, and worries herself and the infant, in attempting to make it nurse. As the inflammation abates, by resolution, or more commonly by suppuration, and the normal secretion returns, the first milk, which is apt to be thick and stringy, should be rejected, after which the infant may nurse as usual. Occasionally, the abscess, which has formed in the breast, connects with a lactiferous tube, so that pus may, on suction, escape from the nipple. If this occur, of course, lactation should be interdicted, until pure milk is obtained. Pus in the milk can sometimes be detected by the naked eye. It presents a yellowish or greenish color, occurring in streaks, when not intimately mixed with the milk. When it is intimately mixed, and in small quantity, it cannot be detected by the naked eye, but the microscope reveals the pus globules. M. Donné relates a case in which he discovered pus globules by the microscope, although there were at first no other evidences of an abscess, and doubts were expressed in reference to the accuracy of his observation. Finally, an abscess pointed and discharged.

---

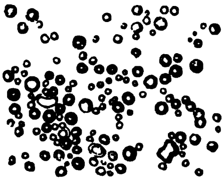
[1] A very similar case recently occurred in my practice. A young and healthy woman from the country, suckling her second infant, on coming to the city, lived in a dark and very imperfectly ventilated room, on the first floor, and in the rear of a crowded tenement-house. She soon lost her appetite, but continued suckling for three months, when she became so anæmic and feeble that she was compelled to seek medical advice. She died without local disease, notwithstanding the most nutritious diet and the free use of stimulants and tonics.

Sometimes, when the inflammation abates, the secretion does not return, and, worse still, occasionally the inflammation has occurred so near the nipple that the lactiferous tubes are permanently closed by it, so that, though milk forms in the breast, there is no escape for it. Thenceforth lactation must be entirely from one breast.

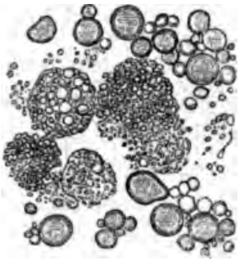
Facts and Rules in reference to Lactation.

The new-born infant should nurse every hour, or every second hour, during the day. At night, if the mother is delicate, and her milk not abundant, it may be fed, once or twice, with a little cow's milk. It is better to select, for this purpose, the upper third of the milk, after it has stood two or three hours, and use it diluted with twice the quantity of water. If the mother is robust, she should not feed the infant, but allow it to nurse once or twice during the night. No nursling, in ordinary health, really requires the breast more than once during the hours which the mother needs for rest; and by a little perseverance on her part its habits may be so established that it is satisfied if it receives the breast no oftener. Many young mothers commence the duty of suckling with too much ardor. Exerting themselves to the utmost for the good of their offspring, they are awake, night after night, giving their breast at every cry, till they find that their strength is failing, and with it, also, their milk. Their self-devotion necessitates early weaning, whereas, had they exercised more regard for their own health, and learned to hear with composure the cries, which often do not indicate any bodily want or distress, they might continue to suckle their infants during the usual period.

The milk secreted during gestation, and immediately after the birth of the infant, differs in its gross appearance, as well as chemical and microscopical characters, from that which is ordinarily secreted in a state of health. It is termed COLOSTRUM. It has a turbid and yellowish appearance, and is somewhat viscid. It is decidedly alkaline, and undergoes lactic acid fermentation more readily than common milk, and it also contains more solid matter. It has an excess of fat, of salts, and, according to Simon, also of sugar. It appears, from Simon's analysis, that the solid matter of colostrum is about seventeen per cent., while that of the ordinary breast-milk is about eleven per cent.



Milk Globules.



Colostrum Corpuscles.

Examined by the microscope, the colostrum is seen to contain oil globules and a viscid substance, which often assumes an ovoid or globular form, but which also exists in irregular masses of considerable size. This substance has been thought by some to be mucus, but it is dissolved by acetic acid and potash, and is tinged yellow by a watery solution of iodine. It is, therefore, to be regarded as albuminous. Imbedded in this substance are oil globules, which are for the most part of small size, while the free oil globules of colostrum are larger than those occurring in healthy milk. This viscid substance, with the imprisoned oil globules, constitutes what has been designated the "colostrum corpuscles." Some have erroneously considered the "colostrum corpuscles" to be compound granular cells. The compound granular cell, or corpuscle, is a cell which has undergone fatty degeneration. It is distended with oil globules to perhaps twice or thrice its normal size. On the other hand, examination of the "colostrum corpuscles" fails to detect a cell-wall, and the large and irregular size of some of these corpuscles negatives the idea that they are cells. The oil globules contained in the viscid substance are more readily acted on by ether than are the free oil globules.

The colostrum is replaced by milk of the normal character, in six to eight days; sometimes as early as the third or fourth day after delivery. In exceptional instances, the colostrum does not disappear for several weeks, and it may reappear at any time during lactation, as a consequence of derangement of the system, or from disease. It is assimilated with difficulty by the digestive organs of the infant, producing usually a laxative effect. It, therefore, aids in the removal of the meconium, and being a normal secretion in the first week of lactation, it is to be regarded as beneficial. Continuing longer than the first week, its effect is deleterious. It produces evident derangement of the digestive organs, and the infant that habitually nurses it, never thrives. It has diarrhœa or vomiting, becomes more or less emaciated, and suffers from colicky pains. Sometimes an extreme degree of exhaustion is reached before the cause is suspected, for, if the milk is pretty abundant, the admixture of colostrum with it cannot be detected by the naked eye. The microscope alone reveals it. The following is an interesting example of this fact. In 1868 an infant six weeks old was brought to me, with the following history. The mother had for years been troubled more or less with dyspeptic symptoms, but had otherwise been in good health. The infant at birth was fleshy and strong, but after the first week it had never thriven like other infants. It nursed regularly, and the quantity of milk was apparently sufficient, but it vomited as soon as it ceased nursing; it was much emaciated, and the bowels were habitually constipated.

The digestive organs of the infant had been in this unhealthy state, with little variation, from the first week, and it was very evident, from the emaciation and exhaustion, that it must soon perish, unless some change were effected. The milk of the mother presented the usual appearance to the naked eye, but under the microscope colostrum corpuscles were observed. A wet-nurse was immediately obtained, and from that moment the gastro-intestinal symptoms disappeared, with a rapid recovery. This case shows at once the evil effects of the colostrum, and the need of a microscopic examination of the milk whenever the nursling suffers from lactation.

Human Milk.

The specific gravity of human milk is about 1032. It has been carefully analyzed by different chemists, with nearly the same result. The following table, prepared by MM. Vernois and Becquerel, gives the proportion of the various ingredients in 1000 parts:—

Water	889.08
Sugar	43.64
Caseum and Extractive	39.24
Butter	26.66
Salts (ash)	1.38
	1000.00

Milk being the sole food of early infancy, contains all the nutritive principles which are required for the growth and repair of the different tissues. The caseum is an albuminous principle, the butter and sugar are combustible substances, and most of the salts which occur in the different tissues exist primarily in the milk. Phosphate of lime, phosphate of magnesia, phosphate of the peroxide of iron, chloride of potassium, chloride of sodium, and soda, known to exist in cow's milk, are believed to occur also in human milk. Epithelial cells are sometimes present, derived from the lining membrane of the lactiferous tubes.

Modifications of the Milk in Consequence of the Diet.

Fresh milk should give an alkaline reaction, but in certain states of ill health, or after the use of certain articles of food, the reaction is acid. Mothers are well aware of the ill effects, as regards the infant, which follow their use of indigestible, or acescent food; and, if prudent, they avoid it. The milk, if the diet of the mother is improper, may become so strongly acid as to cause colicky pains and diarrhœa. The following observations in reference to cow's milk are instructive. We may infer from them that the regimen of the mother exerts a decided influence on the alkalinity of her milk. According to Routh (*Infant Feeding*, page 285), stall-fed cows almost always give acid milk. Dr. Mayer, of Berlin, examined the milk from a considerable number of cows, with the following result:—

(*a.*) Of cows fed with brewers' lees, red potatoes, rye bran, and wild hay, in five instances the milk was slightly sour; in one very much so.

(*b.*) Of forty cows fed with potato mash, barley husk, and clover and barley straw, in ten, which were examined, the milk was sour; in three very sour.

(*c.*) From among fifty cows fed on potato husks, barley husks, and wild hay, five were examined, and in all the fresh milk was sour.

(*d.*) From forty-two cows fed on potato mash, husks, wild hay, and rye straw, out of twelve selected for examination, the fresh milk of all was sour.

(*e.*) From six cows fed by a chief gardener on coarse beet-root, red potato, bran mash, and hay, the fresh milk was slightly sour.

(*f.*) From five cows fed by a cow-feeder on lukewarm bran mash and hay, in four the fresh milk was quite neutral, in one it was decidedly alkaline. (*Routh.*)

The above observations of Dr. Mayer were made in the winter season, and it is possible that the acidity may have been partly due to the confinement of the cows in stalls. But that it was mainly due to the food is evident from the fact that it was greater with some kinds of food than others. Cows' milk is not so alkaline as human milk, and is therefore more readily rendered acid. Still, what Dr. Mayer observed in reference to the cow exemplified a fact of general applicability, namely, that certain kinds of food may affect the alkalinity of the milk, whether human milk or that of animals.

The relative proportion of the different ingredients of the milk varies according to the diet. If the diet is poor, the amount of water increases, and that of butter and caseum diminishes. Lehmann says (*Phys. Chemistry*, vol. ii. p. 65): "From experiments made on bitches, it would appear that a vegetable diet renders the milk richer in butter and sugar; while the solid constituents are augmented when a sufficient quantity of mixed food is given. Peligot found the milk of an ass most rich in casein when the animal had been fed on beet-root; whilst it was richest in butter when the food had consisted of oats and lucerne. Fat food increases the quantity of the butter. Boussingault found the milk of a cow richer in casein when the animal had been fed on potatoes than when other food was taken. Reiset found that the milk of cows which were at grass was much richer in fat than when the animals had stood all night in their stall without food; but Playfair found, on the contrary, that the quantity of butter in the milk increased during the night as much as during their stall-feeding, but that the quantity of butter in the milk was considerably diminished by the motion of the animals in the fields."[1] Simon made the following analyses of the milk of a poor woman. She was suddenly, during the period of lactation, deprived of the means of support, so that her food was insufficient in quantity, and of poor quality. The amount of her milk was not diminished by privation, but the solid constituents were reduced to 86 parts in 1000. After this, for a time, her diet was nutritious and abundant, the quantity of milk was increased, and the solid constituents amounted to 119 parts in 1000. Her diet was again reduced, with a reduction of the solid elements to 98 in 1000, and, at a later period, the diet was again nutritious, with an increase of the solid elements to 126. The chief variation observed in the milk of this woman was in the amount of butter.

Modification of Milk from its Retention in the Breast.

M. Peligot has clearly demonstrated, that the longer milk is retained in the breast the more watery it becomes. This is explained on the supposition that the solid portion is first absorbed. Therefore, the milk is richer the more frequently it is removed from the breast. A similar fact, which has the same explanation, has long been known, namely, that the first milk taken from the breast is thinnest, while that which flows last is richest. That first removed has remained longest in the gland, while that which comes last is but recently secreted.

A knowledge of this fact is of considerable practical importance. The milk, as M. Donné has shown, may be too rich, so as to cause indigestion, with more or less enteralgia, in the infant. Some nurslings, if the milk is too rich and abundant, reject a part of it by vomiting, but others do not, and suffer the consequence in derangement of the digestive organs. For such cases the remedy is, to give the breast less frequently, by which a less amount of milk is taken, and milk of a poorer quality. On the other hand, if there is poverty of the milk, and the infant is insufficiently nourished, the milk is more nutritious if the nursing be at short intervals.

---

[1] Animal Chem., Sydenham Soc.'s Trans., vol. ii. p. 55.

Modification of Milk by Age and by Nervous Impressions.

The composition of the milk varies, also, according to the age of the infant. Simon analyzed the milk of a woman at intervals for the period of about six months. In this case the amount of casein at first was small, but the quantity increased during the two months succeeding delivery, after which it was nearly stationary. A similar increase was observed in reference to the saline substances. The sugar, on the other hand, diminished in quantity as the infant grew older, its maximum amount being in the first and second months. The quantity of butter in the milk varies from day to day more than the other elements.

Many observations have been published which show that the composition of the milk may be materially changed by mental impressions. The infant has died suddenly in the act of nursing, after the mother had been violently excited. Such a case is related by Tourtnal. The infant ceased nursing, gasped, and died in the mother's lap. In other cases convulsions have occurred. MM. Becquerel and Vernois made the chemical analysis of the milk of a woman in a state of nervous excitement, and found that the solid constituents were diminished to 91 parts in 1000, the most marked diminution being in the butter, which was only about 5 parts. In a case related by Parmentier and Deyeux the milk became watery and viscid, and remained so till the nervous attacks, from which the patient suffered, had ceased. Dairymen are well aware how ill-treatment and the separation of the calf from the cow diminishes the milk which she yields. A new milkman seldom obtains as much milk as one with whom the cow is familiar. Bouchut, alluding to the influence of the moral affections on the secretion of milk, makes the following remark, the truth of which most mothers will acknowledge: "It is also a fact, that the sight of the nursling, the idea of seeing it at the breast, and the joy which certain mothers thence experience, exercise a moral influence over the secretion of the milk entirely independent of their will. They feel the draught of milk as soon as they behold their child, or think of it too deeply; and in a woman who saw her child fall to the ground, the flow of milk ceased, and did not reappear until the child, having quite recovered, attempted to take the breast."

Modification of Milk by the Catamenial Function and Pregnancy.

The catamenia reappear in most women before the close of lactation, often by the fifth or sixth month after delivery. If this function is re-established in the normal manner, that is, without any derangement of the system, without pain or undue profuseness, no unfavorable result ordinarily occurs with the infant. On the other hand, if the mother suffer any disturbance of the system, or if the menses are profuse, the lacteal secretion may be so changed, that the infant is injuriously affected by it. The symptoms produced are those of indigestion, such as abdominal pains, more or less vomiting, and diarrhœa. This result is, however, in my experience, quite exceptional. In rare, instances, more dangerous symptoms occur in the infant. A case has been reported to me in which, at each catamenial period, the nursling was seized with convulsions.

MM. Becquerel and Vernois have investigated the character of the milk during the catamenia in three cases. Their examinations showed a moderate increase in the solid constituents. The butter and caseum were increased, while the sugar was diminished. The variation from normal milk was not, however, such as would be likely to cause any serious indisposition. If the menses reappear with regularity, when the infant has attained the age of ten or twelve months, they should be considered as designed to supersede the secretion of milk, which, indeed, usually begins to diminish. Weaning is then proper. If the menses return early in the period of lactation, and give rise to symptoms in the infant in consequence of the altered quality of the milk, it is advisable to allow but little nursing during the catamenia, and to employ artificial feeding in place till the flow of blood ceases.

The change produced in the milk by pregnancy is, in general, more injurious to the nursling than that caused by the reappearance of the menses. The milk of the pregnant woman is apt to contain more or less of that viscid substance which characterizes colostrum. Still, the milk of pregnancy does not, ordinarily, derange the digestive function as much as colostrum, in the first weeks of lactation, for pregnancy rarely occurs till after the infant is five or six months old, when the organs of digestion are less readily disturbed. The injurious effect of pregnancy on the infant is shown by vomiting or diarrhœa, by restlessness and occasional abdominal pains, in fine, by symptoms of indigestion. In many cases, however, these symptoms do not occur, and the infant, though nursing regularly, continues to thrive. No doubt, as a rule, the infant should be weaned when there are clear evidences of pregnancy, but under certain circumstances weaning is injudicious. I have, on different occasions, been called to infants, in midsummer, dangerously sick with diarrhœal attacks induced by this cause. These infants were, perhaps, doing well, or suffering but little from indigestion, when the mothers suspecting themselves pregnant, at once withdrew them from the breast, and cholera infantum or a kindred disease was the result. No infant in the city should be weaned in the hot months. It is much safer, though there are indubitable signs of pregnancy, that it continue nursing till the cold weather. The better method is, however, under such circumstances, to employ a wet-nurse, or to remove the infant to the country, and wean it there. In cold weather, it is usually safe to wean an infant, in the city, after it has reached the age of five or six months.

The milk frequently contains other ingredients in addition to those which have been mentioned. Thus a large number of medicinal substances, taken by the mother, may enter the milk, so as to produce their characteristic effect on the infant. It is a well-known fact, that the peculiar flavor of certain vegetables, taken as food, may be noticed in the milk. It is admitted, also, that the specific virus of the contagious diseases, at least certain of them, may enter the milk, so as to give rise to the same diseases in the infant.

Quantity of Breast Milk required by the Infant.

In a paper published by Dr. W. H. Cumming, in the *American Journal of Medical Science*, July, 1858, it is estimated that the amount of milk secreted per day by a healthy women is one and a half to two quarts, and double the quantity if two infants are suckled. Routh (*Infant Feeding*, page 87) believes that this is a somewhat exaggerated statement. He estimates the amount at a quart to a quart and a half daily. "A three months child," says he, "generally thrives very well on four, or, at the most, five meals a day, the quantity taken each time amounting to a half-pint. This would fix the quantity at two pounds to two and a half, *i.e.*, thirty-two to forty fluidounces. . . . A younger child, one to two months, may need to take his meals more frequently—it may be every two hours, except when asleep—but then the quantity consumed does not exceed, as a rule, as I have often assured myself, two wine-glasses or three ounces every meal. This would raise the quantity taken in twenty-four hours to thirty-six ounces—a quart and a quarter. A child above three months may take about forty-eight ounces daily."

Dr. Cumming, in consequence of his high estimate of the amount of milk which an infant requires, naturally concludes that few mothers can long endure the excessive drain upon their systems, and therefore, in order to prevent their exhaustion, and to satisfy the appetite of their infants, it is necessary, at an early period, to aid by artificial feeding. This opinion may do harm, since artificial feeding of the young infant, especially in the cities, is apt to give rise to indigestion, followed by vomiting and diarrhœa. The mother in good health, and furnishing an average quantity of milk, is competent to give all the nutriment which the infant requires until it has reached the age of four months, and most are till the age of six months. Drs. Merei and Whitehead examined 952 mothers in the Children's Hospital at Manchester, in reference to their physical condition. Of these, 629, or 66 per cent., were in a healthy and robust state. Of this number, namely 629, 420 furnished sufficient milk till six months after delivery, and some till two years.

Differences in Suckling Women as regards Quantity and Quality of Milk.

There is, however, a great difference, in different women, as regards the quantity and quality of their milk, and even the mode in which it is secreted. The best wet-nurses are usually robust without being corpulent. Their appetite is good, and their breasts are distended from the number and large size of the bloodvessels and milk-ducts. There is but a moderate amount of fat around the gland, and tortuous veins are observed passing over it. Such nurses do not experience a feeling of exhaustion and do not suffer from lactation.

The nutriment which they consume is equally expended in their own sustenance and the supply of milk. There are other good wet-nurses who have the physical condition which I have described, but whose breasts are small. Still, the infant continues to nurse till it is satisfied, and it thrives. The milk is of good quality, and it appears to be secreted, mainly, during the time of suckling.

Other mothers evidently decline in health during the time of lactation. They furnish milk of good quality and in abundance, and their infants thrive, but it is at their own expense. They themselves say, and with truth, that what they eat goes to milk. They become thinner and paler, are perhaps troubled with palpitation, and are easily exhausted. They often find it necessary to wean before the end of the usual period of lactation. There is another class whose health is habitually poor, but who furnish the usual quantity of milk without the exhaustion experienced by the class which I have just described. The milk of these women is of poor quality. It is abundant, but watery. Their infants are pallid, having soft and flabby fibre. All these kinds of wet-nurses are met in practice.

Occasionally, a considerable part of the milk is lost by oozing from the breast. This sometimes occurs in robust women, but it is more frequently associated with weakness. It is then due to a relaxed state of the orifices of the milk-ducts. Galactorrhœa, as the excessive secretion and flow of milk is designated, is said to be often associated with a menorrhagic diathesis; that is, women whose menses have been profuse are apt to have too abundant a flow of milk corresponding with the menorrhagia. It is said that galactorrhœa is also apt to occur in those who are subject to discharges from parts which sustain no immediate relation to the breast, as in cases of hæmorrhoidal flux, diabetes insipidus, etc. Excitement, or irritation of the uterus or ovaries, may serve as an exciting cause of galactorrhœa in those predisposed to it, and excessive suckling may have the same effect.

Scantiness of Milk; its Causes and Treatment.

Though the amount of breast-milk which the infant requires is less than was estimated by Cumming, still insufficiency of this secretion is not uncommon, especially in the cities. According to the statistics of Drs. Merei and Whitehead, among healthy mothers there is insufficiency in 16.5 per cent., while among mothers in feeble health the percentage is 46.6. In treating of this subject in the following pages, reference is not had to those cases in which there is temporary diminution of milk from acute disease or other perturbating causes, but to those cases in which there is habitual scantiness.

One cause of scanty secretion of milk is a life of privation or of daily work, which necessitates separation from the infant. Insufficient food may render the milk more watery, as has already been stated, or it may cause diminution in its quantity. The mother thus situated is pallid. She is subject to palpitation and attacks of faintness. Her condition, indeed, is that of anæmia. Working women have scantiness of milk, not only in consequence of hardships, but also because they are usually separated for hours from their infants. Age is also a cause of scantiness of milk. Mothers at the age of forty years ordinarily furnish less milk than between twenty and thirty. And those who have not borne children till late in life, and whose mammary glands have therefore long been inactive, have less milk than those who commence bearing children at the usual period.

Routh speaks of hyperæmia as a cause of defective lactation. "This is a variety," says he, "which I have chiefly observed among hired wet-nurses, selected from the poorer classes, and admitted into wealthier families. . . . When feeding at the expense of a master or mistress, the amount they devour often surpasses all moderate imagination. They, in fact, gormandize. If in such instances a wet-nurse is given all she asks for, she will be found often to eat quite as much as any two men with large appetites; and, as a result, she becomes gross, turgid, often covered with blotches or pimples, and generally too plethoric to fulfil the duties of her position. The plethora, as first induced, is of the sthenic variety, but it soon assumes an asthenic character, and, as the immediate result, the breast no longer secretes its quantum of milk. There may be good milk secreted, but it is in small quantity, and this quantity diminishes daily. The breast may also enlarge, but it is from a deposition of fatty tissue in and about it, as in other parts of the body. The veins on the surface become less apparent, always a bad feature in a suckling breast, till finally the flow of milk ceases altogether."

Atrophy of the breast from the employment of iodine, or from long disuse, is also a cause of insufficiency of milk.

It is so necessary for the health and development of the infant that the milk should be in proper quantity as well as quality, that it is proper in a work of this kind to consider the treatment of insufficient secretion, and, on the other hand, of excessive secretion and loss of milk, or galactorrhœa. And first of insufficient or scanty secretion.

The most efficient mode of increasing the lacteal secretion is that which is also natural, namely, suction from the nipple. There are many cases on record in which this has produced the flow of milk in women who have never borne children, and even in men. Baudelocque mentions the case of a girl, eight years old, who suckled her brother for a month, and cases at the opposite extreme of life have been reported; one of a woman of seventy years, who wet-nursed a grandchild twenty years after her last confinement.

Travellers among barbarous nations or tribes have often observed these cases of unnatural lactation. Humboldt saw a man, thirty-two years old, who gave the breast to his child for five months, and Captain Franklin, in the Arctic regions, met a similar case. Dr. Livingstone, in his account of Africa, says that he has examined several cases in which a grandchild has been suckled by a grandmother, and equally remarkable instances of lactation occur among the negroes of the Southern and Middle States. Prof. Hall presented to his class in Baltimore a male negro fifty-five years old who wet-nursed all the children of his mistress. In these cases of abnormal lactation, so far as we have complete records of them, it is ascertained that the breasts were torpid, and even sometimes, as in old people, atrophied till the nursing commenced. Titillation, or pressing of the nipple, caused an afflux of blood to the gland, and developed its functional activity, so that milk was produced for the sustenance of the nursling. Therefore, in case of scanty secretion of milk, the mother may increase the quantity by applying the infant often to the breast. If, dissatisfied with the small amount of nutriment which it receives, it refuses to make the necessary suction, any other mode of gentle traction or pressure may be employed in addition. The occasional employment of another infant, or a pup, milking the breast with the thumb and fingers, or the gentle suction of a breast pump, aids in stimulating the secretion. Forcible rubbing or traction of the breast defeats the purpose for which it is employed. It produces too much irritation and tenderness. The best mode of stimulation is by nursing, as it is the natural mode, and the moral effect of the infant at the breast aids in promoting the secretion.

Another mode of increasing the functional activity of the mammary glands is by the electrical current. The fact is established by physiological experiments, that glandular organs can be made to secrete more actively by the stimulus of electricity, and, accordingly, this agent has been successfully employed to promote the secretion of milk. In Routh's *Infant Feeding* several cases are related which show the beneficial effects of this agent (page 149 *et seq.*). Among them are six reported by Dr. Skinner, of Liverpool. In all these, one or two applications of the electrical current sufficed to restore the secretion. The following is Dr. Skinner's mode of employing this treatment:—

"1. *Direct.*—Both poles must terminate in cylinders, with sponges well moistened in tepid water. The positive pole is pressed deep into the axilla, while the negative is lightly applied to the nipple and the areola; the current being no stronger than is agreeable to the patient's feelings. The poles are kept in this position for about two minutes. Both poles are then to be inserted into the axilla, and gradually brought together, the negative to the sternal, and the positive to the opposite of the organ. This latter step may occupy one or two minutes more.

"2. *Intramammary.*—The poles are to be, as it were, imbedded in the mamma, and moved about, raising and depressing both poles at once in and around the organ for the space of another two minutes. The same is to be done to both breasts daily, until the secretion is properly established. Hitherto one or two sittings have always sufficed in my hands." (*Communication of Dr. Skinner to Dr. Routh.*)

In all cases of scanty secretion of milk, the regimen of the mother is a matter of importance. Personal and domiciliary cleanliness is essential for successful wet-nursing. A certain amount of exercise in the open air is conducive to the health of the mother, and to the secretion of abundant and healthy milk. A case is related to show the effect of fresh air and out-door exercise on the lacteal secretion. A lady of cleanly habits, living in London, had a very scanty supply of milk. She removed to the pure air of the sea-shore, and immediately the quantity became abundant, and continued so for months. Such cases are not unfrequent. A mode of life that contributes to the general health of the mother will not fail to augment the quantity of her milk, if it is scanty, and to improve its quality.

Much has been written in reference to the diet of women who suckle. It is a popular belief that certain articles of food promote the secretion of milk much more than other articles, though equally nutritious. No doubt, writers have erred in recommending exclusively this or that kind of food, as most likely to produce milk. The exact kind of food which is preferable, in a certain case, depends partly on the physique of the individual, and partly on the character of the food to which she has been accustomed. A mixed diet contributes most to the sustenance of the mother, and to an abundant secretion of milk. Animal substances which furnish a due supply of nitrogenous aliment should be given with the farinaceous. Mothers pallid, and inclining to an anæmic condition, require a larger proportion of animal diet than those in good general health. On the other hand, plethoric women, such as Routh describes, who with excellent appetites consume large quantities of food, and who become more and more full-blooded, and corpulent while the milk diminishes, require a more restricted animal diet, in connection with more exercise, especially in the open air.

There are certain kinds of food which do appear to have a galactogogue effect with most wet-nurses. Oatmeal gruel is one of these. Wet-nurses often remark, after taking a bowl of this, that they feel the flow of milk. Cow's milk with some has a similar effect. Porter or ale, taken once or twice a day, also promotes the secretion of milk, especially in those who have poor appetite, and whose systems are somewhat reduced.

A great variety of medicines have been used for their supposed galactogogue effect. Medicines which improve the general health are, no doubt, sometimes useful for this purpose, such as the vegetable and ferruginous tonics, and perhaps cod-liver oil. But there are other medicines which it is claimed have a specific effect on the mammary gland, promoting its secretion. Lettuce, winter-green, fennel, the broom tops (cytisus scoparius), marsh-mallow, castor oil plant, and many other plants, have been used for this purpose. There can be no doubt that the aromatic stimulants, as fennel, anise, and caraway seeds, given in soups, sometimes stimulate the lacteal secretion. But the medicine which of late has attracted most attention in the profession, as a galactogogue, is castor oil and the plant from which it is derived.

The galactogogue effect of the leaves of the castor oil plant has been long known to the Spaniards in South America. At least as long ago as the commencement of the last century, the ricinus communis was applied by them externally to the breast, to promote the secretion of milk. It is now about twenty years since this use of the plant was brought prominently to the notice of the profession in this country and in Europe. In the London *Journal of Medicine*, 1857, Dr. Tyler Smith relates the results of his experiments with the castor oil plant. He applied the bruised leaves over the breasts, and witnessed, as he thinks, an evident galactogogue effect. Dr. Routh has also made pretty extensive use of the plant, both externally and internally. He was led, he says, to employ it internally, from noticing, in suckling women, an increase of milk after taking a dose of castor oil. He prescribed a decoction of the leaves and stalks, and says: "I have not been disappointed. The flow has been remarkably increased. Four objections against its use, however, should be mentioned." These are, first, a peculiar sensation in the eyes, with dimness of sight, an effect which he has observed only in weak women; secondly, the necessity of increasing the dose as the patient becomes accustomed to it; thirdly, scarcity of the plant; fourthly, an occasional diuretic, sometimes without galactogogue effect, and sometimes with it. The cases in which diuresis occurred were in the practice of other physicians, and Dr. Routh conjectures that this effect was produced by not keeping the breast warm during the time that the decoction was being employed. The breasts should at the time of its use be covered with a fomentation of leaves, or an extract of the leaves should be rubbed over the breasts in the same way in which extract of belladonna is used, and over this a warm poultice applied of the ordinary material. Dr. Routh remarks: "When the castor oil leaves are given as an infusion to women who are not suckling, I have observed two effects, both of which seem to denote its specific action. First, it produces internal pain in the breasts, which lasts for three or four days. Then, secondly, a copious leucorrhœal discharge takes place, after which the effect on the breasts entirely disappears."

Dr. Gilfillan, of Brooklyn, has also employed the ricinus communis successfully as a galactogogue. He employed a poultice of the pulverized leaves, and gave internally the fluid extract of the leaves, a teaspoonful three times daily. The patient had been confined the year before with her first child, but had no milk for it, though her health was good, and measures were employed, as friction and fomentations, to stimulate the secretion. The ricinus was prescribed the fourth day after her confinement with the second child, when there were no signs of secretion, and the breasts were small. "About two hours after the poultice was applied, and the first dose taken, she experienced a strange sensation in the breasts, and this increased after each dose of the medicine. The poultice was not renewed, but the extract was continued for three days, after which lactation was perfectly successful." So far observations have shown that the ricinus is the most efficient galactogogue which we possess among medicinal agents.

In the treatment of galactorrhœa the object to be attained should be kept in view. There are medicines which cure this affection by diminishing the amount of milk. Belladonna, iodide of potassium, and colchicum are antigalactics. It is proper to use them in case of weaning or of death of the infant. They not only reduce the quantity of milk, but, continued, may prevent its secretion. They are employed not to benefit the infant, but the mother.

On the other hand, if it is our purpose to prevent the oozing of milk in order to save it for the infant, or, if it is abundant and watery, to diminish somewhat its quantity and improve its quality, the treatment should be different. Iron, in cases of galactorrhœa, in which the condition of the system appears to indicate the need of it, will diminish the quantity of milk and render it richer. It is by many regarded as an antigalactic, and given long it might reduce too much the amount of the secretion, and even necessitate weaning. Its use should be discontinued if no more than the normal amount of milk is secreted.

In most cases of true galactorrhœa the pathological state is that of weakness and relaxation of the tissues. The fault is not excessive secretion of milk so much as its non-retention, and the medicines which are the most useful to correct this state of the system and of the breasts are the vegetable tonics and astringents. If galactorrhœa occur in those who have an habitual discharge, and it appears to be due to the same cause which produces that discharge, and there are no evidences of weakness, laxative medicines and other derivatives may be employed. But such cases are not common. Nux vomica has been recommended in galactorrhœa, in the belief that it diminishes the relaxation of the orifices of the lactiferous tubes.

Local treatment in this affection is important. A cloth wrung out of cold water should be occasionally applied around the nipple, and removed as it becomes warm. Solutions of tannin or alum are likewise useful. Collodion applied around the nipple, by its retraction, diminishes the orifices of the ducts, and thus aids in the retention of the milk.

CHAPTER V.

SELECTION OF A WET-NURSE.

In the cities, cases are frequent in which mothers, with all possible care or endeavor, find themselves unable to suckle their infants. Their health is too poor, or the milk possesses the properties of colostrum, or it is no longer secreted on account of nervous excitement, or exhaustion, or inflammation of the breasts. The number of such cases, in the city, would surprise physicians who are familiar only with the healthy and robust mothers of the country. The infant thus deprived of the mother's milk should, if practicable, be furnished a wet-nurse.

The selection of a wet-nurse often devolves upon the physician, and it is a duty of great responsibility. It is better to select one between the ages of twenty and thirty years, and one who has suckled an infant previously. A wet-nurse between the ages of twenty and thirty is usually more active, cheerful, and conciliatory than one of a more advanced age, and her milk is more apt to be abundant and nutritious. Those who have previously suckled and had charge of infants are obviously more competent to serve as wet-nurses than are primiparæ. The milk of a wet-nurse, whose infant is under the age of six months, will ordinarily agree with a new-born infant. If above that age, it sometimes agrees, but often does not.

The most difficult and responsible task imposed on the physician, in the selection of a nurse, is to ascertain the exact condition of her health, and the quantity and quality of her milk. Constitutional syphilis is common in the class of women who present themselves for wet-nursing; it is often latent, or its symptoms are easily concealed, and it is communicable by lactation. The virus may be received by the infant from fissures or excoriations of the nipple. The nursling tainted by syphilis may, on the other hand, communicate the disease to the nurse through the same source. It is not fully ascertained whether the syphilitic virus may be conveyed to the infant by the milk. But the cases which have accumulated in the records of medicine are numerous, in which infants born of healthy parents have been fully syphilized by lactation from diseased nurses (see article Syphilis). These infants have sometimes led a short and miserable existence, and have occasionally increased the misery of the household by imparting the disease to others. The duty is, therefore, imperative on the part of the physician to examine carefully the wet-nurse, in reference to any evidences of the syphilitic taint. Acquainted with the symptoms of syphilis, he may usually, by shrewd questioning and by careful examination of the present appearance and condition of the woman, ascertain with considerable certainty whether her system has ever been infected. References should also be obtained and consulted, and, if practicable, the physician who has attended her be communicated with.

There are, also, among the women who present themselves for wet-nursing in the cities, many of a scrofulous habit, many who possess an hereditary tendency to tuberculosis, if indeed they do not already have the incipient disease. Such applicants should be rejected, on account of the poverty of their milk and the probability that they will not be able to endure the debilitating effect of lactation.

The milk should be examined, in order to ascertain its richness and quantity, and whether it contains colostrum. If there is colostrum after the eighth day, it is probable that there is some fault in the health or digestion of the wet-nurse, and that her milk may disagree with the infant. It is not necessary that the breasts should be large, in order to furnish a sufficient quantity of milk, since, as has been already stated, in some the secretory function is active during the time of each nursing, so that, although the breasts are of moderate size, a sufficient amount of milk is furnished. The nipples should be well formed and prominent, and preference is to be given to those wet-nurses in whom vessels are seen ramifying over the breasts.

By examination of the milk, its degree of richness can be readily ascertained. A quantity of it should be placed in a test-tube, and the cream, which rises to the top, indicates, approximatively, the character of the milk. Good milk furnishes three per cent. of cream, and the caseum and sugar usually correspond in quantity with the cream. An instrument has been invented, called the lactometer, by which the exact amount of the cream can be ascertained. It is simply a tube graded into 100 divisions. It is placed upright, and filled with milk, and the number of divisions occupied by the cream indicates its proportion in 100 parts. The lactoscope is another instrument employed for the purpose of ascertaining the richness of the milk. It consists of two concentric tubes, which move upon each other. Milk which we wish to examine is poured within the tubes sufficient to obscure a light viewed through it, three feet distant. The column of milk is then diminished, till the light begins to be visible. The size of the column indicates the degree of opacity and the richness. The lactoscope was invented by M. Donné, and is described by him.

Dr. Minchin recommends a simple mode of determining the richness of cow's milk, and it would equally answer for the breast milk. A vessel holding about one ounce, and containing a graduated enamel slab, passing diagonally from above downwards, is filled with milk. It is then covered with a glass slide carried over it in such a way as to exclude bubbles. The number of degrees which can be read, indicates the character of the milk, as regards its richness.

Examination of the milk with the microscope not only enables us to determine whether there are abnormal corpuscles or granular elements, but also its richness. It should be examined before the cream has separated. Oil globules of small size, and few, indicate poverty of the milk; very large oil globules are said to indicate milk which is apt to be indigestible, especially in feeble infants. Such are the free globules of the colostrum. Numerous oil globules of medium size indicate nutritious milk. Vogel, in 1850, made the discovery of vibriones in human milk. The fact is established that these animalcules may be generated in the milk within the breast, though such cases are not frequent. Dr. Gibb describes a case which he met. (*Ranking's Abstract*, vol. xxxiv.) An infant, 7 weeks old, wet-nursed by its mother, who had the appearance of perfect health, was, nevertheless, ill-nourished and emaciated. It had no diarrhœa or other apparent disease, and the milk was therefore examined. Vibriones baculi were found in the milk immediately after it was obtained from the breast. The milk had the usual amount of cream, and seemed to the naked eye of good quality. According to Dr. Gibb, two genera of animalcules occur in the milk, namely, vibriones and monads. It is believed that the monads occur in consequence of fermentation of the sugar and the production of lactic acid. Vogel also attributed the production of the vibriones to fermentation occurring in consequence of heat and congestion of the breast, connected with sexual excitement. This explanation is probably not correct, because vibriones sometimes occur when there is no unusual heat of breast, and no evidence of fermentation. The fact that such organisms may occur in milk which seems of good quality to the naked eye, affords additional proof of the usefulness of the microscope in the selection of a wet-nurse.

Many wet-nurses have a return of the menses as early as the fourth or fifth month after delivery. The re-establishment of this function in some women impairs the quality of the milk, so as to render it less nutritious, and perhaps less digestible; in other women it does not sensibly affect the character of the fluid or its quantity. In the selection of a wet-nurse, then, preference should be given to one who does not have the periodical sickness, but if she is already employed, and gives satisfaction, the reappearance of the catamenia does not indicate the need of a change of nurse, unless the digestion of the infant is disordered, or its nutrition is impaired.

In the selection of a wet-nurse attention should also be given to her mental and moral traits. Cheerfulness, affection, veracity, and a proper appreciation of the responsibility of her situation enhance greatly the value of a wet-nurse. Not less important are habits of temperance and cleanliness. I could cite cases of the most melancholy results from the absence of these traits. In one case idiocy resulted from an infant falling upon the pavement from the arms of a reckless or intemperate wet-nurse.

In most cases the mode of examination indicated above suffices to show the character of a wet-nurse, so far as her health and milk are concerned. It should be borne in mind, however, that the microscope does not always reveal deleterious properties in the milk. Elements which are in a state of solution, and are invisible, may occur in excess, so as to impair the quality of the milk, and render it indigestible. The following case, in which the saline ingredients seem to have been in excess, is related by Dr. Hartmann (*British and Foreign Medical Review*, vol. xii.): "An infant whose mother was in good health, and had borne several children, exhibited a healthy appearance for the first five weeks after birth. The alvine evacuations then became copious, fluid, and discolored, and the child lost flesh and strength. After the usual remedies had been vainly administered for a fortnight, the mother remarked that the child did not take the right breast willingly, and so much did the unwillingness increase, that at length the mere application of the nipple to the child's lips occasioned loud crying. On examination it was found that the milk of the right breast had a distinctly saline taste; whereas the milk of the opposite breast was of the ordinary sweetness; no difference of consistence or color was discoverable. From that time the child was only allowed to nurse the left breast, and in a few days all diarrhœa and sickliness of appearance vanished." In this case there was no appreciable disease of the breast, although its secretion was perverted. The deleterious character of the milk was discovered, not by any change in its appearance, but by the taste.

CHAPTER VI.

COURSE OF LACTATION—WEANING.

REGULARITY in nursing is required. The young infant in whom the milk is rapidly assimilated, may take the breast every two hours in the day, and two or three times in the night. Still, as M. Donné has said, mathematical exactness in this matter would be ridiculous. Quiet, natural sleep of a well-nourished infant should not be interrupted in order to give it the breast, unless the sleep be unusually protracted. It will usually awaken when the system requires more nutriment. Ill-nourished infants, according to my observations, sleep but little until they become much prostrated, when they are drowsy, in consequence of passive congestion of the brain. This drowsiness is evidently a pathological symptom. It shows the need of increased nutrition. It is due to scantiness of milk, or milk of poor quality, and the infant should be aroused frequently for the purpose of giving it nutriment or even stimulants.

As the infant grows older the stomach receives a larger amount of milk, and it should nurse less frequently. The breast milk is sufficient for its nutrition till the age of six or eight months, provided it is abundant and of good quality. If the mother is strong and experiences no exhaustion from suckling, the infant, therefore, need receive no other nutriment till that age, or indeed till the age of ten or twelve months.

Many mothers, however, by the third or fourth month of lactation find that they have not sufficient milk to meet the wants of the infant. The constant drain upon their systems sensibly impairs their health. In such cases it is proper to commence with a little feeding from the spoon or bottle, and increase the quantity given as the infant grows older. Great care is, however, requisite in the preparation of food for so young an infant, whose digestive organs are still feeble and easily deranged. In the country, where diarrhœal affections and the so-called gastric derangements are not frequent, the danger from artificial feeding is less than in the city, and in the cool months in the city the danger is less than in the summer season. Infants of the city, between the months of May and October, have a strong predisposition to diarrhœal attacks, the result of anti-hygienic influences which surround them. Errors of diet in their case readily provoke disease or derangement of the digestive organs, often of a severe and dangerous form. Moreover, experience has shown that these infants, if fed with the bottle, however carefully, during the period when nature designed that they should be nourished by lactation, very commonly are affected in the hot months with more or less vomiting and diarrhœa, followed by emaciation and other evidences of mal-nutrition. Therefore, an exception must be made in case of the city infant as regards the commencement of artificial feeding. If it is under the age of one year, it should be nourished exclusively, or almost exclusively, at the breast during the hot months, when practicable, even if the mother suffers somewhat in her health from the constant drain upon her system. The infant should, however, receive the amount of nutriment which it requires, and, if there is not sufficient breast milk, it will be necessary to supply the deficiency by artificial feeding.

The subject of artificial feeding will engage our attention in a separate chapter. It suffices, therefore, in this connection to state that nursing infants of three or four months may begin to take a little cow's milk, carefully prepared and of the best quality. It should be diluted, but the amount of dilution required obviously depends on the richness of the milk. Rich country milk is sufficiently diluted, if the infant is in good health, by adding half its quantity of water, while most samples of milk furnished in the city do not require more than one-third their quantity of water.

A little sugar of milk, which is slowly soluble, should be dissolved in the water before its mixture with the milk. One drachm of the sugar is sufficient for five or six ounces of the milk, and to the same quantity, if the stools are at all acid, two teaspoonfuls of lime-water should be added. An alkali taken with cow's milk retards the coagulation of casein in the stomach, and tends to prevent the formation of a large, thick curd in the stomach, which is with difficulty digested. If, therefore, the child vomits such curds, or passes fragments of them in the stools, a larger proportion of lime-water may be added, or the carbonate of soda as recommended by Vogel, who dissolves one drachm of the carbonate in six ounces of water, and adds a teaspoonful to the milk at each meal. It is proper, also, to allow farinaceous food to an infant of three or four months, if its digestive organs are in good condition. I prefer barley flour for this purpose to arrowroot, rice, or wheat flour.

Barley-water should be prepared from Robinson's or some other flour of good quality, and mixed while still warm with an equal quantity of milk, and the sugar of milk added. The barley-water should be of about the consistence of milk, and prepared in the usual way by boiling. The milk should not be boiled. It may, indeed, be stated, as a rule, that it is not advisable to boil milk designed for infants, except in the city, where it may be boiled in order to its better preservation. Toast-water may be also employed for diluting the milk, but it is less nutritious than barley-water. At the age of six months, if the infant is in good condition, the milk need not be diluted.

As the infant grows older, semi-liquid food may be given. Pap prepared with stale bread, or a rolled soda-cracker, may now be given, once or twice daily, between the times of nursing, and occasionally beef-tea or chicken-broth, thickened with cracker or bread, is taken with relish, and if well prepared, and given no oftener than once or twice a day, it is commonly readily digested, while it is highly nutritious. If the quantity of breast milk diminishes, as it often does, towards the close of the first year, artificial food should be given oftener, so as to supply the deficiency. Solid food requires considerable development of the digestive organs for its ready assimilation. It should not, therefore, be given till the close, or near the close, of the first year.

Weaning ought to take place, as a rule, between the ages of twelve and eighteen months. It is well, if the mother's health is good, and her milk is sufficient, to defer weaning till the canine teeth appear. The infant then, possessing sixteen teeth, is able to masticate the softer kinds of solid food. Weaning should be gradual. Mothers often speak of weaning on a certain day. They have given but little artificial food, and have suckled at regular intervals, till at a fixed time they have denied the breast altogether. This abrupt change of diet should be discouraged. It should only be recommended under peculiar circumstances. It is apt to derange the digestive organs, and it causes fretfulness and sleeplessness on the part of the infant for a week or more. Weaning should commence by feeding with the spoon, a little oftener through the day, and nursing less, and by discontinuing the practice of suckling at night. The infant tolerates this gradual change of diet, while it rebels against sudden weaning, and by its fretfulness increases greatly the care and trouble of the mother. The infant in the city should not be weaned in warm weather, nor within a month immediately preceding it. If the mother's health fails or her milk becomes deficient, in the summer months, so that she cannot continue suckling, the infant should be sent immediately to the country, or a wet-nurse be employed. Many infants are sacrificed in consequence of ignorance of the danger of weaning under the circumstances mentioned. Severe diarrhœa, inflammatory or non-inflammatory, is apt to result. This subject will be considered elsewhere.

CHAPTER VII.

ARTIFICIAL FEEDING.

Occasionally the mother is unable to suckle her infant, and a hired wet-nurse cannot be or is not obtained. Artificial feeding is then necessary. In the large cities, if I may judge from our New York experience, this mode of alimentation for young infants should always be discouraged. It generally ends in death, preceded by evidences of faulty nutrition. A considerable proportion of those nourished in this manner thrive during the cool months, but on the approach of the warm season they are the first to be affected with diarrhœa and other symptoms indicating derangement of the digestive function. In my opinion, based on a pretty extended observation, more than half of the New York spoon-fed infants, who enter the summer months, die before the return of cool weather, unless saved by removal to the country. In the country, and in the small inland cities, the results of artificial feeding are much more favorable. The majority live, and in elevated farming sections, on account of the salubrity of the air, and the facility with which milk, fresh and of the best quality, is obtained, artificial feeding appears to be nearly as favorable as wet-nursing.

Young infants, fed by the hand, obviously require food prepared so as to resemble as closely as possible the human milk. The basis of such food must, therefore, be the milk of some animal. The following table, prepared by MM. Vernois and Becquerel, gives the proportion of the ingredients of human milk, and the milk of the four domestic animals which is most easily obtained and most frequently employed as food.

Composition of Milk.

	Specific gravity.	100 parts contain—		The solid components consist of—			
		Fluids.	Solids.	Sugar.	Butter.	Casein and extractive matters.	Salts.
Man	1032.67	889.08	110.92	43.64	26.66	39.24	1.38
Cow	1033.38	864.06	135.94	38.03	36.12	55.15	6.64
Ass	1034.57	890.12	109.88	50.46	18.53	35.65	5.24
Goat	1033.53	844.90	155.10	36.91	56.87	55.14	6.18
Ewe	1040.98	832.32	167.68	39.43	54.31	69.78	7.16

Cow's milk is most readily obtained, and is commonly used as a substitute for human milk, compared with which it contains less water and sugar, but more butter, casein, and salts. Its composition, however, varies considerably according to the food of the cow and other circumstances. The variations in the milk of the cow, according to the nature of its food, have been considered in a preceding chapter. It has been stated, also, that the milk first obtained in milking is most watery, since it is longer secreted than the last milk, or the "stripping." The stall-fed cow gives acid milk, while the cow grazing in a pasture gives milk that is alkaline. Again, the milk in the first months after calving is richer than after the lapse of several months.

It is obvious from the above facts that the analysis of different specimens of cow's milk must differ greatly, and the same is true of the milk of the goat and ass, and probably of the ewe. In fact, different samples of the milk of the same animal may differ more from each other, in their chemical character, than the average milk of one animal from that of another.

The milk of the goat and that of the ass have been recommended as food for infants in preference to cow's milk, on the ground, as is alleged, that they more nearly resemble human milk. But by reference to the foregoing table it will be seen that more importance has been attached to this supposed resemblance than the facts justified. Neither the milk of the ass nor goat, so far as its chemical character is concerned, would seem to possess any advantages over cow's milk. The ass's milk is procured with difficulty, and is seldom used. An objection to goat's milk is the unpleasant odor which it often possesses, due to the presence of hircic acid. It is stated, however, by Parmentier, that this odor is only noticed in the milk of goats that have horns. An important advantage, in the city, in the use of goat's milk, is that the animal can be kept at little expense, so that even poor families who are not able to purchase and feed a cow can generally possess a goat, from which fresh milk can be obtained at any time. Preference is to be given to goat's milk when fresh, over cow's milk brought from the country, perhaps watered on the way, and several hours old when received. If, however, as both chemical analysis and experience show, goat's milk is no better as food for infants than cow's milk when fresh and from healthy cows, the latter must continue in common use for this purpose.

Milk used for infants should always be alkaline. If it is acid, as shown by the proper test, it should be rejected; or, if there is none better, should be rendered alkaline by the addition of lime-water or carbonate of soda. The nurse should test the milk at different periods through the day, and be taught to make the necessary addition. M. Donné prefers the first milking, when it is possible to obtain it. This contains a smaller proportion of solid elements than the average milk, bears a closer resemblance in its chemical character to human milk, and requires but little dilution. The upper third of the milk, after it has stood two or three hours, is also preferable, as the casein, which is digested with more difficulty than the other elements, has a high specific gravity and tends to settle towards the bottom. If the infant is under the age of two or three months, the milk should be diluted with one-third or one-half its quantity of water. After the age of three or four months, it requires no dilution. It should always be given at a uniform temperature, namely, a little warmer than the body. Employed habitually too hot or too cold, it is apt to cause stomatitis, if not more serious disease of the digestive organs.

After the fourth month, the infant may be allowed crushed soda cracker, or stale bread upon which boiling water is poured and then drained off, and afterwards milk added. Porridge made with rice, barley flour, or arrowroot is also a proper article of diet at this age. After the fifth or sixth month, milk with crumbled soda cracker or stale bread may also be allowed.

The shops contain various preparations of food for infants, and most of them have been employed in the institutions of this city sufficiently to ascertain their effects. The one which has given most satisfaction is known as Nestle's Lacteous Farina, prepared by Henri Nestle, a Swiss chemist. It is preferred in the Nursery and Child's Hospital, and Infant's Hospital, to Liebig's Soup, but the latter, so highly extolled by the German physicians, and a description of which will be found in the appendix, may not have been well prepared in these institutions. Nestle's food is, however, expensive, and although infants thrive well on it in the cooler months, I am of opinion, from my own observations, that in the hottest weather, when diarrhœal affections are so prevalent and fatal, it has too laxative an effect. I do not, therefore, recommend as the ordinary diet of healthy infants any other food than the mother is able to prepare readily, with milk, or, under certain circumstances, barley-water, as its basis.

In the first half year it is most convenient and otherwise preferable to give the food through a sucking-bottle, after which the infant may be fed with a spoon, or taught to drink from a cup. The physician should positively forbid the use of sugar teats and various sweetened admixtures which nurses are so apt to employ, as they tend to produce simple stomatitis, sprue, and, if much employed, even indigestion and diarrhœa.

Between the ages of one and two years the teeth have become sufficiently developed for the mastication of light food. Tender and finely cut meat, potato baked and mashed, bread and butter, and even certain fruits carefully selected, may then be allowed. After the age of two years less rigid surveillance of the food is required, but the variety is sufficient if all dishes except the most bland and unirritating are excluded till after the first years of childhood. The reader is referred to Appendix A for various dietary formulæ and directions relating to the choice and preparation of food, which will be found useful in the treatment of young children, in those diseases especially in which the digestive function is seriously impaired.

CHAPTER VIII.

BATHS—CLOTHING.

Daily ablution of the infant conduces to its comfort and health. If under the age of two months, it should be bathed daily in water of about the temperature of 92°. As it grows older the temperature should be gradually reduced, a bath at 88° to 90° being proper for an infant between the ages of three and six months, and one at 86° for an infant between six and twelve months. In the second and third years the temperature of the bath should be about 84°. After the bath, which should continue from five to ten minutes, the surface should be gently rubbed with a soft towel to produce reaction and a glow of the skin, which would prevent danger of taking cold.

The clothing of children, especially in our variable climate of the north, is a matter of importance, and one in regard to which the parents often require instruction. It may be stated, as a rule, that the chest and abdomen of the infant should be so covered with flannel that there is no danger of producing chilliness by a sudden reduction of the external temperature or exposure to a current of air. By this precaution many cases of laryngitis, bronchitis, and diarrhœal affections, now so common in infancy, might be avoided. In winter the flannel should be thick, and in the summer thin. Even in the hottest weather the abdomen should have a light flannel covering, which increases the comfort, if the surface is in the normal state. If lichen, which is not uncommon in the warm months, appear upon the surface, I would not remove the flannel, but place under it linen or soft muslin.

The popular idea that children may be hardened by exposure to the weather in scanty clothing, and by being bathed, even at the most tender age, in water at so low a temperature as to produce chilliness, cannot be too strongly combated. The hygienic management of the child should always be such as insures present comfort. If it do not, if it is regarded with aversion and dread by the child, the method is wrong.

The dress should always be so loose as to allow free movements, and not embarrass in the least any of the functions. This is a matter which is left too much to the discretion and intelligence of the nurse, who is usually so ignorant of the important facts in physiology that she unwittingly, and with the best intentions, injures her charge. I have often interposed to loosen the dress of the new-born, which was so tight as to sensibly embarrass respiration; and one case has been reported to me in which it appeared that death resulted from this cause. Infants, especially, who are so liable to pulmonary collapse and intestinal hernias, should have loose covering of both chest and abdomen.

The feet of children should always be warm. Infants require flannel stockings, thick or thin, according to the season Care should be taken that the shoes produce no compression, and they should be exchanged for those of a larger size as often as is required by the growth of the feet. Deformity of the feet or toes, ingrowing toe-nail, and induration of the skin, can sometimes be traced back to tightness of a shoe in childhood.

Physicians are so well aware of the importance of domiciliary cleanliness and ventilation, of the free admission into the nursery of solar light, and of the importance of out-door exercise as a means of invigorating the system and promoting healthy functional activity, that nothing need be stated in reference to these subjects in this connection.

CHAPTER IX.

ACCIDENTS AND AILMENTS INCIDENTAL TO THE BIRTH OF THE INFANT, AND DETACHMENT OF THE CORD.

Apnœa (Asphyxia) Neonatorum.

In the healthy infant, born under favorable circumstances, the two important functions of life, respiration and circulation, are established within the first minute. But it not infrequently happens, in consequence of some unfavorable circumstance, that the heart and lungs fail to act, and the infant lies motionless as one dead. Sometimes in these cases an occasional pulsation of the heart can be detected when the fingers press under the left ribs, but there is no respiration. According to the nature of the cause, the surface is exsanguine or cyanotic and livid.

Causes.—These are various. The fault may be partly in the infant; it may be feeble in its development; but the common causes are compression of the cord during birth, from breech presentation or otherwise, powerful, frequent, and long-continued uterine contractions, often induced by ergot, but sometimes occurring normally, which compress the placenta, and consequently obstruct the fœtal circulation; detachment of the placenta before birth, and protracted labor, from pelvic malformation or otherwise, even when there is no unusual severity of the pains.

Treatment.—Obviously the treatment must be prompt. Mucus should be removed from the mouth and fauces with the finger, and, except in those cases in which there has been placental hemorrhage or anæmia from other causes, as exhibited by pallor of the surface, a few drops of blood should be allowed to run from the cut extremity of the cord. The flow induced aids in establishing the circulation, and, in the large proportion of cases in which there is congestion of internal organs, gives partial relief to it. Brisk rubbing of the body, slapping the buttocks, blowing in the face, sprinkling water upon it, alternately transferring the body from a tub of hot to cold water may be tried in quick succession, and, if there are no signs of returning animation, no time should be lost in resorting to artificial respiration.

The child should be placed on its side upon the edge of a table, with a blanket underneath it, and the head in such a position that the epiglottis falls forward; a towel or napkin should be placed over its face, having a hole of sufficient size to blow through corresponding with its mouth. The physician compressing firmly the epigastrium with his thumb, blows a full breath through the hole. A little of the air, notwithstanding the compression, enters the stomach, some may escape by the nostrils, and the rest enters the lungs. Immediately, the hand passing from the epigastrium to the thorax, compresses it gently though with sufficient force to produce expiration. This should be repeated six or eight times per minute. The action of the heart, previously slow, becomes quicker by the artificial respiration, and I am confident that I have been able to produce pulsations by this method when the heart had ceased to beat, and death, to all appearance, had occurred. Some recommend placing the infant on the right side, on account of the position of the valve between the auricles, but I think it is better to change it from one side to the other, in order to prevent congestions, which are so apt to occur when the circulation is imperfect. The circulation always commences sooner than respiration. The first respirations are mere gasps, not more than one or two per minute in cases of decided asphyxia, but as they become more frequent they are also deeper.

Artificial respiration should be continued ten or fifteen minutes in cases in which no action of the heart can be detected by pressing the fingers under the ribs, when, if there are no signs of returning animation, the case is hopeless. If there is any pulsation, however feeble, we should not cease in the attempt at resuscitation. Some prefer insufflation through a tube (as the segment of a catheter) introduced into the larynx, and pressure upon the thyroid cartilage so as to close the pharynx, instead of upon the epigastrium. The principle of treatment is similar, but the mode which I have recommended above I have found successful beyond expectation. Thus, in one case in my practice in which pulsation in the umbilical cord had ceased from ten to fifteen minutes before birth in consequence of its prolapse, I employed artificial respiration nearly a quarter of an hour before there was any appreciable pulsation, but by perseverance the circulatory and respiratory functions were fully re-established, and the child lived and was vigorous. When respiration commences insufflation may cease, but it is proper to aid the respiratory movements a little longer by compressing the thorax after each inspiration. Still, the physician may be disappointed in the result. In not a small proportion of cases the respiration continues gasping, and after a few hours, perhaps even a day, death ensues. I have made post-mortem examination of several infants who have died under such circumstances, chiefly in the Nursery and Child's Hospital, about six from recollection, and have found considerable uniformity in the appearance of the viscera. Only a small portion of the lungs, sometimes almost none at all, was found inflated, even when the cries had for a time been strong, and extravasated blood usually in considerable quantity lay upon the surface of the brain, evidently having escaped from the meningeal vessels, which were in a state of extreme congestion in consequence of the protracted or difficult birth. Meningeal apoplexy therefore seems to me the chief cause of the ill-success attending our efforts to save those who are so far resuscitated as to be able to breathe.

Caput Succedaneum—Cephalæmatoma.

During the birth of the child, extravasation of blood not infrequently occurs in the part of the scalp which presents. This results from the passive congestion, more or less intense according to the duration of labor and severity of the labor-pains, which occurs in the presenting part, whether scalp, arm, or breech. CAPUT SUCCEDANEUM is the term employed to designate the swelling thus caused. Its seat is the loose connective tissue of the scalp external to the pericranium. The tumor is soft, painless, and usually located upon the occiput. It consists partly of extravasated blood, but largely of serum which has transuded from the congested vessels before that degree of congestion was reached required to effect the transudation of the corpuscles. I have repeatedly had an opportunity to examine this tumor in stillborn infants brought from the lying-in wards attached to the Nursery and Child's Hospital, and have found when it was slight that it consisted almost entirely of serum, but ordinarily when dissected it presented the appearance of a bruise, with a large proportion of serum, the blood and serum infiltrating the scalp to a greater or less distance beyond the appreciable limits of the tumor. Caput succedaneum requires no treatment. As it lies in the loose connective tissue of the scalp, its liquid permeates the open areolæ in every direction, to be rapidly absorbed, while the tumor disappears. The subsidence of the swelling is usually complete within forty-eight hours.

Occasionally blood is extravasated under the pericranium, detaching it from the bone. This occurs in connection with caput succedaneum, and is observed when the latter declines. The tumor thus produced is designated cephalæmatoma. It is situated upon the occipital or parietal bone, near the posterior fontanelle. Its base corresponding with the denuded bone is circular or oval, and it rarely crosses a suture. In rare instances two cephalæmatomata occur, located upon the occipital and one parietal, or upon both parietal bones. The liquid, being surrounded by the firmly attached pericranium, does not escape in the surrounding tissues, as the caput succedaneum, and is therefore much more permanent. It flattens slowly by absorption, and does not disappear till after several weeks. At the age of six months a slight prominence can sometimes be detected, indicating the seat of the tumor. As the pericranium elevated by the blood does not lose its vitality, it soon begins to produce bone, so that after some days a ring of new bone can be detected by the finger surrounding the base of the tumor, and on the inside of the detached membrane a layer of bone is produced, thin at first and flexible, but gradually approximating the old bone, and becoming firmer as absorption occurs.

Some time since, a specimen was presented by me to the N. Y. Pathological Society, showing this accident and the mode of cure. The child died about two months after birth, and the blood constituting the tumor, which had been in great part absorbed, was completely encased by the old bone below and the new thin formation above. The cavity at length becomes obliterated, and there only remains some thickening of that part of the cranium which corresponds with the location of the tumor.

CHAPTER X.

CONJUNCTIVITIS NEONATORUM.

INFLAMMATION of the conjunctiva in the new-born is not an unusual disease. We distinguish two forms of it, differing in gravity. It commences in the first week, and commonly about the third day.

CAUSES.—The causes of conjunctivitis neonatorum are not the same in all cases. The *grave* form, which has been designated purulent ophthalmia, has been known to occur during epidemics of puerperal fever, probably from the epidemic influence. Another cause, one which is easily understood, and which is universally recognized by the profession, is the introduction under the eyelids, during the birth of the child, of a particle of the vaginal secretion of the mother. The ordinary leucorrhœal, and still more gonorrhœal, secretion has this effect. Moreover, all accoucheurs meet occasional sporadic cases in cleanly and highly respectable families, occurring from some unknown cause, though perhaps in a certain proportion of these cases also a little of the leucorrhœal discharge coming in contact with the conjunctiva has produced the inflammation. Certainly in private practice gonorrhœal infection is in only a small proportion of cases the cause of purulent ophthalmia of the new-born. Some observers, as Prof. Gross, believe that the most frequent cause of purulent ophthalmia of the new-born is atmospheric.

The causes of the mild form are different also in different cases. Prominent among them are bad hygienic conditions, exposure of the eyes to a current of cold air, and the introduction of a little of the vernix caseosa or soap under the lids in the first washing.

SYMPTOMS. *Severe Form.*—In the beginning the palpebral conjunctiva is observed to be red, a little swollen, and its cutaneous surface presenting a faint reddish tinge. The light appears to be painful, and the child is fretful and sleeps but little; but the eye itself presents its normal appearance. The progress of the disease, however, is rapid, and in twenty-four or thirty-six hours there is so much tumefaction that the upper lid extends over the lower, and it may be impossible to separate them sufficiently to obtain a view of the eye. The tumefaction is due to œdematous infiltration. The conjunctiva, both palpebral and ocular, now presents a deep red hue, is thickened and swollen, and numerous fine granulations appear upon it: occasionally also flakes of very delicate pseudomembrane can be observed in addition. There is an abundant production of pus of a creamy appearance, sometimes tinged with blood, which oozes out when the lids are separated. A critical period has now arrived, one which may involve the destruction of the cornea unless the case is promptly and judiciously treated. Indeed, the gravity of the disease relates chiefly to the state of the cornea, which up to the present time, notwithstanding the severity of the inflammation and the amount of surrounding infiltration, has remained transparent and apparently unaffected. But within another twenty-four hours the cornea may lose its polish, and grayish, opaque spots of softening appear upon it. Soon perforation occurs, the aqueous humor escapes, and the iris falls forward, closing the aperture and preventing further loss of the liquids of the eye.

I have observed destruction of the cornea and loss of sight chiefly, first, in cases of true gonorrhœal infection, in which there is the maximum amount of inflammation and tumefaction, extending even over the malar bone and supra-orbital ridge, with marked redness and elevation of temperature of the lids; and, secondly, with a less degree of inflammation in those who were highly scrofulous. In other cases I am of opinion that the cornea can ordinarily be preserved with proper treatment, although there may be so much purulent discharge and œdema that it may be impossible to see it for several days. Occasionally the cornea, instead of sloughing, becomes infiltrated to a greater or less extent, and ulcerates, but without perforation. As the patient recovers, cicatrization occurs.

The inflammation soon begins to decline. The swelling, heat, and redness of the lids and conjunctiva, and the granulations, gradually disappear, and recovery is complete, except so far as the cornea may have been injured.

Mild Form.—The inflammation is from the first of a mild grade, pertaining chiefly to the palpebral conjunctiva, with but a slight discharge of purulent matter, and with little swelling or increase of heat in the lids. Attention is directed to the complaint chiefly by the secretion which collects in the angles of the lids or upon their border. There may be slight intolerance of light, and ordinarily minute granulations appear upon the inflamed mucous surface. This form of the disease may disappear within a few days, or it may be protracted.

The conjunctivitis of the new-born is contagious, some forms of it highly so. It commences on one side, and, without precautions, commonly within a few days extends to the other.

TREATMENT.—As soon as the inflammation occurs, the opposite sound eye should be covered with a compress, kept in place by strips of adhesive plaster. This eye should be examined, however, once or twice daily, in order to detect the commencement of inflammation, and the bandage reapplied.

The *mild* form of conjunctivitis requires very simple treatment. Frequently bathing the lids with lukewarm water, or milk and water, so as to remove the secretion from between the lids, suffices in a large proportion of cases. Among the poor the mothers ordinarily bathe the lids with breast milk, and by this simple treatment effect a cure. If the inflammation should not abate soon by this treatment, a mild collyrium of one-eighth grain of nitrate of silver to one ounce of water should be applied between the lids and allowed to run under them.

The severe form, or purulent ophthalmia, on the other hand, requires prompt and judicious management. There is scarcely a disease in which delay is more disastrous.

The frequent removing of the pus is very important, which is confined in large quantity underneath the closely compressed lids, and by its pressure and irritation increases greatly the danger of destruction of the cornea. Therefore the lids during the height of the inflammation should be pressed apart every hour, so as to allow the pus to escape, and the space between the lids be freed from pus by a camel-hair pencil. Occasionally warm water may be thrown under the lids by a small glass syringe, to wash away pus and any flakes of pseudo-membrane. Probably three or four drops of carbolic acid to each ounce of the water would be beneficial, from the known good effect of this agent on suppurating surfaces, but I have never employed it.

Medicinal applications to the inflamed conjunctiva should, in my opinion, be simple and mild, but frequently applied. It is known that Von Gräfe recommended the application of nitrate of silver as a caustic; but the operation is painful and difficult, for it requires eversion of the lids. I much prefer, in the treatment of purulent ophthalmia, the application of a weak solution of corrosive sublimate every three hours between and under the lids, the pus, so far as practicable, having been first removed by the brush and syringe. I employ the following formula, and the result has, in my practice, been so favorable that I have not felt justified in trying another:—

℞. Hyd. chlor. corros. gr. j ;
Aquæ rosarum ℥ij ;
Aquæ ℥vj. Misce.

Still, the beneficial result which I have observed in cases treated with this collyrium was no doubt partly due to the frequent removal of the pus, the importance of which cannot, in my opinion, be too highly estimated. In ordinary or mild cases of purulent ophthalmia, a light poultice of ground slippery elm, mixed with sugar of lead water, will be found useful; but if there is great heat and swelling of the lids, a preferable application, while the inflammation is intense, are pieces of a single thickness or two thicknesses of muslin or linen an inch and a half square, taken from a cake of ice on which they lie, and renewed every two or three minutes when they begin to be warm. When the inflammation has become less intense, and the danger of the destruction of the cornea is passed, the poultice or sugar of lead wash may be employed instead. The decline of the inflammation is gradual, though generally pretty rapid. Occasionally granulations remain upon the lids. If they do not diminish and disappear when the purulent inflammation has ceased, I would not practise excision, as recommended by Vogel, but, having everted the lids, apply a solution of nitrate of silver, five or ten grains to the ounce, to the granulations each second day, and immediately wash away the solution by a camel-hair pencil with lukewarm water, and apply a little sweet oil before the lid is returned. If the granulations do not disappear with this treatment, they may be lightly touched with the smooth surface of a crystal of sulphate of copper, followed by the application of water and sweet oil. By this mode of treatment, employed from the commencement of the inflammation, a large proportion even of the severest cases recover with good vision.

CHAPTER XI.

DISEASES OF THE UMBILICUS.

When properly managed, the cord desiccates and falls off between the third and ninth days. The nurse should not be allowed to oil it, which she will sometimes do unless forbidden, as this retards desiccation. If the dressing of the cord is allowed to remain wet from the urine or otherwise, the cord does not desiccate, but decomposes. This is not infrequent in poor, intemperate, and slovenly families. The decaying cord is apt to produce inflammation of the navel. Some southern physicians, prior to the late war, attributed the prevalence of trismus neonatorum among the slaves to the lesion of the navel produced by this cause, the trismus being then essentially traumatic.

Inflammation of the Umbilical Vein and Arteries.

When at birth the cord is ligated, if the child is in its normal state, clots form in the umbilical vessels from the navel inwards.

Atrophy of the vessels follows, and by the twenty-fifth day they are represented by small, firm, fibrous cords. Sometimes, though rarely, a true phlebitis or arteritis occurs in these vessels in the first days after birth, due either to the low vitality of the child and decomposition of the fibrinous plugs and gelatinous substance of the cord, or the entrance into the vessels of purulent or decaying matter from the fossa of the umbilicus. We are sometimes able, by pressing along the abdominal walls towards the umbilicus, to squeeze out a few drops of the decaying and purulent substance. The navel itself is usually inflamed at the same time. This is a very serious disease. Pus, with particles of disintegrated fibrin, is apt to pass along the vessels and enter the circulation, and, being intercepted in distant parts, gives rise to embolismal inflammations. This seemed to be the cause of several subcutaneous inflammations, and points of embolismal pneumonitis in a new-born infant which I attended in 1868. The infant belonged to a family highly scrofulous and prone to scrofulous inflammations. Umbilical phlebitis and arteritis are said to occur most frequently in lying-in institutions during epidemics of puerperal fever.

TREATMENT.—In the manner already indicated we should attempt gently to press out any purulent and decomposing substance from the vessels, and the infant should be placed with its abdomen dependent so far as it can be done without rendering it uncomfortable, so as to aid in the escape of the liquids by gravity. The umbilical fossa should be kept clean, and warm water containing a little carbolic acid may be dropped upon it several times daily. The abdomen should be covered with a soft and warm poultice.

Inflammation and Ulceration of Umbilicus.

Inflammation of the umbilicus sometimes occurs in the newborn about the time of the detachment of the cord, or soon after. It probably results from uncleanliness, or carelessness in the management of the cord, by which irritating and decomposing substances remain in the umbilical fossa. Sometimes decomposing particles from the cord are the probable irritant. This disease is also most apt to occur in cachectic infants, or those of scrofulous parentage, whose general condition renders them liable to inflammations. The umbilicus becomes red, slightly swollen, and moist by a secretion. Often the inflammation remains two or three days in this mild form, receiving no treatment except from the nurse, and disappearing by the use of the dusting powder which she employs. In other instances, the inflammation extends over a radius of an inch or even more, the walls of the umbilicus become swollen and infiltrated, and ulceration succeeds. The ulcer is circular, occupying the site of the navel, and attended by a purulent discharge. The inflammation may now gradually abate, and the ulcer heal with a cicatrix in place of the umbilicus. But in other instances, especially if there is a decided cachexia, the ulcer extends in breadth and width, till finally, in the worst cases, the peritoneum becomes involved, and perforation or peritonitis occurs, with death.

Under unfavorable hygienic circumstances, the blood of the infant being vitiated, the ulcer may become gangrenous, or the inflammation may terminate directly in mortification, without the formation of an ulcer. In either case the prognosis is unfavorable, if dark brown slough occupies the site of the umbilicus, and a sero-sanguineous discharge exudes from underneath. The common result is perforation, peritonitis, and death in from one to two weeks.

TREATMENT.—Inflammation of the umbilicus, if at all severe, and especially when attended by any destruction of the tissues involved, rapidly reduces the strength. In such cases three or four drops of brandy should be administered every two hours in the breast milk.

In the simple inflammation the navel should be bathed with lukewarm water three or four times daily, and the ointment of the oxide of zinc be constantly applied; or if there is little or no discharge, the navel may be dusted with the powdered oxide of zinc. In case of ulceration the navel should be gently washed three or four times daily with lukewarm water, to which carbolic acid is added—five or six drops to the ounce; and if there is much inflammation, a light poultice of pulverized slippery elm should be applied in the interval, or if the inflammation is moderate, the balsam of Peru. If gangrene supervene, the parts should be frequently bathed with the carbolic acid water, and a cloth soaked with it be applied over it. The slough should be detached as soon as it is so far separated that its removal causes no hemorrhage, after which the treatment for ulceration is appropriate.

Umbilical Granulations or Fungus.

When the cord falls, granulations sometimes sprout out from the exposed raw surface, and complete cicatrization is impossible till they are removed. They form a rounded mass of a pale reddish hue, at the centre of the umbilical fossa, bleeding when rubbed, and causing constant moisture of the umbilicus. The largest which I have seen had perhaps twice the size of a large pea, and they may be of any smaller size.

TREATMENT.—By pressing upon the umbilical parietes the tumor rises from the fossa, so that a silk ligature can be applied around its base, when the mass can be readily removed with the scissors. If the granulations are small, they may be removed by the scissors, without the ligature, and hemorrhage prevented by touching the surface with lunar caustic.

CHAPTER XII.

UMBILICAL HEMORRHAGE.

THE granulations which have been described above sometimes cause considerable hemorrhage when injured. The profuse and even fatal hemorrhage which occurs at birth, or soon after, from too loose a ligature of the umbilical cord, or from laceration or other injury, is so well known, and its cause so apparent, that it need only be alluded to in this connection. Bouchut details a case in which death occurred even before birth, from this form of hemorrhage. The child was attached to the placenta by a very short cord, which prevented delivery till it parted by the traction of the forceps; but the bleeding from the umbilical vessels was so profuse, that the child was pallid and lifeless when born.

There is another form of umbilical hemorrhage, cases of which have been from time to time observed for more than a century (one of the first on record was reported in the *Gentleman's Magazine*, April, 1852, by Mr. Watts, a physician in Kent, England), but little was done to elucidate its nature till three American physicians made it the subject of careful study, and the monographs which they have published upon it are the best which the literature of the profession affords. Dr. Francis Minot read his paper, containing the statistics of 46 cases, before the Boston Society for Medical Improvement, in April, 1852. Prof. Stephen Smith prepared his paper, containing the statistics of 79 cases, for the New York Statistical Society, in 1855. It was published in the *New York Journal of Medicine* for that year. Dr. J. Foster Jenkins presented his monograph as a report to the United States Medical Association in 1858, and it was published in the *Transactions* of the Association for that year. This paper is very valuable on account of its statistics, as the writer succeeded in collecting the records of 178 cases, from medical journals, and gentlemen of the Association. These three papers contain nearly all that is known in reference to this disease.

Sex, Age.—Females are less liable than males to this hemorrhage. In Jenkins's cases, 34¼ per cent. were females, 65¾ males. The following table gives the age at which the hemorrhage commenced in 99 cases:—

Age.	Nos.
Under 1 day	5
" 2 days	7
" 3 "	6
" 4 "	3
5 to 7 " (inclusive)	32
8 " 10 " "	25
11 " 15 " "	16
16 " 21 " "	4
56 "	1
	99

Ordinarily the hemorrhage commenced very soon after detachment of the cord, but in not a few the cord was still adherent.

Causes.—The common proximate cause is feeble coagulability of the blood. In the normal state, when the cord is ligated, the fibrin of the blood, which now ceases to flow in the umbilical vessels, forms coagula so firm that, by the time the cord is detached, hemorrhage is impossible. But in the majority of those affected with this disease the clots are so soft and loose that they do not present any effectual barrier to the pressure of blood, which therefore oozes through them or presses them away. This lack of coagulability is easily demonstrated, for if a little blood, as it escapes, is caught in a vessel, it will be found to remain liquid a long time. This dyscrasia, or morbid state of the blood, which we therefore recognize as a chief cause of the hemorrhage, does not have the same origin in all cases. It is sometimes due to inherited syphilis. The infant affected with it may be plump, and appear well at birth, but, in most instances, when the hemorrhage is to occur, it is puny and cachectic, exhibiting also local manifestations of the disease with which it is affected. Thus, in a case in my practice, the infant, puny, and apparently born before term, was observed to have several blebs of pemphigus on the first day, from some of which blood soon began to ooze, but the fatal umbilical hemorrhage did not commence till after two weeks.

In about one-fifth of the cases ecchymoses or petechiæ have been observed upon various parts of the surface, affording additional proof of the general blood disease.

Jaundice is another cause of impoverishment of the blood in the new-born, and therefore of umbilical hemorrhage. The writers who have collected records of the hemorrhage, all remark the frequent occurrence of the icteric hue, both before and during the bleeding. It is not improbable that, in certain instances, the jaundice is hæmatogenous, arising from destruction of the red corpuscles, and liberation of the hæmatin, a not unusual result of a profound dyscrasia, whether syphilitic or originating in some other cause. But in other, and probably most instances, the jaundice proceeds from the liver, and is the cause of the change in the blood. Thus, in five of Jenkins's cases, there was occlusion of the hepatic or common bile-ducts, and jaundice, from the presence of biliary acids in the blood, causes diminution in the amount of fibrin and red corpuscles. In the ordinary form of icterus neonatorum, the cause of which is found in the relative fulness of the capillaries and minute bile-ducts in the acini of the liver, the coagulability of the blood must evidently be impaired in proportion to the degree and duration of the jaundice.

Poor health of the mother, and impoverishment of her blood during gestation, whether from chronic disease, as tuberculosis, or anti-hygienic conditions, also causes impoverishment and diminished coagulability of the blood of the child, and is therefore a cause of the hemorrhage. The excessive use of diluent drinks or alkalies by the mother is believed by some to have a similar effect.

In certain cases the hemorrhage is due to an inherited hemorrhagic diathesis. In nine of Jenkins's cases the mothers were subject to menorrhagia, and liable to bleed freely after parturition, and from injuries; and seventeen other mothers had each lost more than one infant from umbilical hemorrhage. Probably in those cases in which the hemorrhage commenced before detachment of the cord, and external to the point of insertion, the hemorrhagic diathesis is the main cause of the flow.

Although the cause of umbilical hemorrhage in the majority of cases is the vitiated state of the blood itself, high authorities, among others Sir James Y. Simpson, have met cases in which the hemorrhage was referable to the state of the vessels. In order that the vessels be effectually closed by the fibrinous coagula, their walls should have their normal contractility, but this is in great part lost, by inflammation (arteritis or phlebitis) which sometimes occurs in these vessels, as we have already seen. Inflammation, whether of artery or vein, causes thickening and infiltration of its parietes, loss of tone on the part of the fibres of which they are composed, and therefore a patulous state of the vessel. Moreover, the inflammation is apt to be suppurative, and the presence of pus in the vessel obviously hinders the formation of a firm and effective coagulum.

SYMPTOMS.—Ordinarily umbilical hemorrhage occurs without any premonition, but sometimes it is preceded by jaundice. Jenkins ascertained that jaundice was a prodromic symptom in 41 out of 178 cases, and, with the icteric hue, constipation, clay-colored stools, deeply tinged urine, etc., were sometimes recorded. Rarely colicky pains and vomiting preceded the hemorrhage. The blood may be arterial or venous, or both. It oozes slowly or rapidly, rarely escaping in a jet, even when there is reason to believe that it is arterial.

PROGNOSIS.—This is unfavorable. Statistics show that five in every six perish. The prognosis is most unfavorable when jaundice or purpura is present. Those are most likely to recover who have a healthy parentage, no obvious dyscrasia, and in whom the hemorrhage occurs late and is not profuse. The average duration of the hemorrhage in 82 fatal cases in Jenkins's collection was 3½ days, the minimum being only three hours. After the arrest of the hemorrhage, death may occur from exhaustion or the dyscrasia.

TREATMENT.—The treatment should be both constitutional and local. It is important, so far as time will permit, to treat the dyscrasia, and as the stools are apt to be constipated, a laxative is ordinarily indicated. A laxative is not only useful for its effect on the hepatic circulation, but as a derivative. Both Smith and Jenkins recommend calomel for this purpose. The modes of treating the bleeding part have been various. Those most deserving of mention are the following: injecting a styptic into the open vessels, applying a styptic by compress or sponge to the navel, covering the navel with dry or wet plaster of Paris, constant pressure with the finger, which is tedious, but which maternal solicitude willingly provides, and lastly the use of needles with ligature. All of these methods have been more or less successful in arresting the hemorrhage, but the last is most effectual, though painful.

Two needles should be passed through the umbilicus at right angles, and a waxed thread wound around each in the form of figure 8. In four or five days the needles should be removed, and a poultice or simple dressing applied.

CHAPTER XIII.

DIAGNOSIS OF INFANTILE DISEASES.

General Observations.

DISEASES in early life differ in important particulars from those occurring in maturity. Some which are common in the former age are unknown or are rare in the latter, and those which occur equally at all ages often present peculiar symptoms and a peculiar clinical history in the young. Therefore physicians who are skilful in treating adults, may be unskilful in treating children. Excellence as a physician of children can only be achieved by special and continued study of their ailments.

Again, as regards the diseases of infancy, in which period there is a great amount of sickness and a large mortality, diagnosis must evidently be made from the objective symptoms; from examining the features, attitude, utterances, the pulse, respiration, etc., and inspecting the surfaces, so far as they are accessible to view, and the eliminative products. We lack for this age the important information which speech affords. Some general remarks, therefore, in reference to the appearances and functions of the system in early life, and the changes which they undergo in various pathological states, seem requisite, in order to a clearer appreciation of the symptoms, and more ready diagnosis of individual diseases.

Features, External Appearance of Head, Trunk, and Limbs in Disease.

In the new-born, as soon as respiration and the new circulation are established, the cutaneous capillaries become distended with blood, and the skin presents a congested appearance. By the close of the first week this external hyperæmia begins to abate, and is soon replaced by the normal capillary circulation.

Icterus is common in the first and second week. Bouchut attributes it to mild hepatitis. A much more plausible view of its causation, and probably the correct one, is that of Frerichs, who attributes it to the effect on the hepatic circulation of ligation of the umbilical cord. By ligation the current of blood through the umbilical vein to the liver ceases, the amount of blood in the hepatic capillaries, which connect with the branches of the vein, diminishes, and then, according to Frerichs, diversion occurs of a part of the bile from the hepatic cells into the capillaries, while the rest flows in the normal manner in the bile-ducts. The degree of jaundice is proportionate to the amount of bile which enters the circulation. Icterus neonatorum is not a disease of importance. It subsides without medicine in the course of one or two weeks, when the circulation through the liver becomes equalized and regular.

The surface, or portions of the surface, of the new-born often present for a few hours a livid color due to the mode of delivery. Protracted lividity occurs from atelectasis or malformation in the heart or great vessels; lividity induced by exertion or excitement while the respiration is normal, indicates malformation of the heart or vessels; temporary lividity sometimes occurs in severe acute diseases, especially those of the respiratory organs; lividity, whether temporary or permanent, is a sign of imperfect decarbonization of the blood.

The cheeks of children are congested in febrile and inflammatory diseases, except in cachectic or prostrated state of system. Transient circumscribed congestion of the face, ears, or forehead constitutes a reliable sign of cerebral disease. Strabismus occurring in connection with febrile reaction, oscillation of iris, inequality of pupils, and drooping of upper eyelids, also denote cerebral disease. The pupils are contracted during sleep; evenly dilated in death.

Dilation of the alæ nasi during inspiration, with contraction of the eyebrows and a countenance indicative of suffering, attends severe inflammation of the respiratory organs. Absence of tears during the act of crying shows a severe and probably fatal form of disease in infants over the age of four months.

Rapid wasting of the features, causing deep suborbital depressions, prominence and pointedness of the cheek-bones and chin, and hollowness of the cheeks, is a sign of a severe diarrhœal affection; the most striking examples of this sudden collapse of features are afforded by patients affected with cholera infantum. In severe cases of this disease, the physiognomy, from a state of fulness and health, presents in a few hours such a wasted and senile appearance that the friends with difficulty recognize the features with which they are familiar. Muscular tonicity is also greatly impaired in this disease, that of the orbicular muscles of the lips and eyelids to such an extent that the mouth is open and eyeballs exposed during sleep. Great emaciation occurring gradually, is a symptom of subacute or chronic disease of a grave character, often of tuberculosis or chronic entero-colitis.

Strabismus sometimes occurs in children who have no serious disease. It is then due to simple paralysis of one or more of the motor muscles of the eye. But when supervening upon other symptoms of a neuropathic character, it is a grave symptom, indicating organic disease of the encephalon, as effusion, meningitis, etc. A permanently downward direction of the axes of the eyes, with smallness of the face and great expansion of the cranium, is a sign of congenital hydrocephalus. The scalp in this disease is tense, bald, or sparingly covered with hair, the fontanelles and sutures open and enlarged, and the cranial bones yielding to pressure. Great expansion of the cranium above the ears, while the frontal portion is not enlarged, or but slightly, denotes hypertrophy of the brain.

The appearance of the general cutaneous surface possesses much greater diagnostic value in the diseases of infancy and childhood than in those of adult life. The eruptive fevers so common in the young, and comparatively rare in the adult, reveal themselves to us in great part by the changes which they cause in the appearance of the integument. The peculiar color of the skin in constitutional syphilis, hereafter to be described, and which is more marked in infancy and early childhood than at any other age, is a diagnostic sign of great value in obscure cases. In the infant the cold stage of intermittent fever is manifested, not by muscular tremors, but by lividity, pallor, and the goose-skin appearance of the surface.

Bulbous enlargement of the fingers and incurvation of the nails are signs of cyanosis, and therefore of malformation at the centre of the circulatory apparatus, or of tuberculosis, or chronic pulmonary disease attended by malnutrition. Enlargement of the spongy portions of bones, causing prominences, softness, and bending of the bones, and consequent deformity of the limbs, patency of the fontanelles, a large and square shape of the head from calcareous deposit external to the cranium, are among the signs of rachitis.

In early infancy the glands of the skin and mucous surfaces, or which connect by their orifices with these surfaces, are slightly developed. Therefore sensible perspiration and lachrymation are rare under the age of three months. A thick Meibomian secretion of a puriform appearance collecting between the eyelids, is an unfavorable prognostic sign; it indicates a state of great depression; it is observed most frequently in cerebral and intestinal affections a little before death. Passive congestion of the vessels of the conjunctiva sometimes occurs under the same circumstances, due to feebleness of the heart's action, and imperfect capillary circulation. It indicates the near approach of death.

Attitude—Movements—The Voice.

A sharp, piercing cry, head firmly retracted, flexure of the limbs with a degree of rigidity, adduction of the great toe, clonic or tonic spasm of the muscles, irregular movements of one or more limbs, with consciousness impaired, or with mental hallucinations, are symptoms of grave disease of the cerebro-spinal system. Irregular muscular movements partly controlled by the will, and occurring during full consciousness, are symptoms of chorea, a disease nearly always ending favorably in children, though incurable in the adult. Contraction of the eyebrows, turning of the eyes and face from light, avoidance of noises, as if painful, are signs of headache. Frequent carrying of the hand to the ear, and pressing with the ear against the breast of the mother or nurse, are symptoms of otalgia. Frequent carrying of the fingers to the mouth, in connection with fretfulness or other symptoms of suffering, indicates stomatitis, gengivitis whether from difficult dentition or other causes, painful pharyngitis, or some obstructive disease of the larynx. Frequent rubbing or pressing the nose may be due to intestinal worms or intestinal irritation from other causes. It may be due to coryza or headache. Frequent forcible rubbing or striking the nose should lead to a careful examination and perhaps guarded prognosis. It often indicates grave cerebral disease, and may be a precursor of convulsions.

In severe obstructive disease of the larynx, the child is restless, moving from side to side. In most inflammations of the respiratory organs, a semi-erect position gives most relief. The voice in severe laryngitis is often hoarse or indistinct, and usually so in the pseudo-membranous form; in pleuritis or pneumonitis it is restrained and abrupt, since the movements of the walls of the chest give pain.

The voice in severe diseases of the abdominal organs is feeble and plaintive. It is sometimes short and restrained in acute dyspepsia, in peritonitis, and in cases of great abdominal distension.

The horizontal position gives most relief in abdominal diseases. In case of abdominal pain the patient often presses his hand upon the abdomen and flexes his thigh over it. Perfect quietude, with features sunken, and unchanged by smile or crying, is a symptom of severe and exhausting diarrhœal affections.

Respiratory System.

The respiration of the infant under the age of six months is very irregular, and it is more irregular the nearer the time to birth. If the new-born infant is closely observed, it will be seen to sigh often; it breathes pretty uniformly and regularly for a moment, and then, without appreciable cause, the respiration is intermitted; it holds its breath when it smiles or moves its head, or even its limbs; it is very subject to hiccup; this is more common the first week of life than at any other age. So much is the breathing of the young infant disturbed by these causes, that the number of respirations ordinarily varies in consecutive minutes. In order, therefore, to determine with accuracy the frequency of the normal respiration for this time of life, it is necessary to take the average of several observations.

At birth, while the function of the heart has for months been regularly performed, the lungs are still quiescent. The one organ has been active during the greater part of fœtal development, the other is yet untried. Hereafter, the new order of things, so intimate is the relation between the heart and lungs, that the proper performance of the function of one is essential to that of the other. Therefore the commencement of respiration and the return of circulation, which is modified and temporarily arrested at birth, are nearly simultaneous. Respiration commences in the first half-minute of independent existence; often, indeed, attempts to inspire occur before the delivery is completed. The exceptions to this early establishment of respiration are, after tedious or unnatural births. The return of circulation is a moment later.

RESPIRATION IN HEALTH.—As the air-cells at birth are closed, the establishment of respiration is difficult. The air at first penetrates a few pulmonary cells, but gradually more and more are inflated through the forcible inspirations which the crying of the infant produces, till after a variable time respiration becomes easy and complete. If the cry is feeble, and especially if with this feebleness there is considerable congestion of the brain, the result of tedious birth, the full establishment of respiration is in a corresponding degree gradual and slow.

The frequency of the respiration in health should be ascertained, in order to determine whether, in a given case, it is abnormally accelerated. The following table embodies the result of observations which I have made, in order to determine the normal frequency of respiration in the first year of life.

Normal Infantile Respiration (number per minute).

	AGE.										
	First half hour.	From first half hour to close of first week.		From close of first week to close of first month.		From close of first month to close of third.		Close of third to close of sixth month.		Close of sixth month to close of first year.	
		Awake.	Asleep.	Awake.	Asleep.	Awake.	Asleep.	Awake.	Asleep.	Awake.	Asleep.
Number of observations....	29	28	14	13	13	16	10	25	7	19	6
Extreme number of respirations per minute......	25–104	32–64	40–64	40–96	28–60	32–68	28–52	36–88	24–40	28–64	24–36
Mean number of respirations per minute........	48.5	52	52	59	45	51	39	54	33	41	29

As the child advances from the age of one year, the number of respirations per minute gradually diminishes; but through the whole period of childhood it remains greater than in the adult. At the age of five years, when the child is quiet, but awake, it is about 27; at the age of ten years, about 22.

Respiration in Disease.—In cerebral diseases the respiration is apt to be slow, and if somnolence occur, intermittent, and accompanied by sighing. In young infants, in the drowsiness which supervenes when the blood is imperfectly decarbonized, during severe attacks of capillary bronchitis, or broncho-pneumonia, respiration is apt to be intermittent.

In inflammatory diseases of the larynx and trachea, respiration is but slightly accelerated, and, if there is no obstruction, its rhythm is normal; if there is obstructive disease, its rhythm is altered; the inspiratory act is lengthened. In bronchitis, respiration is accelerated in proportion to the degree of extension downward of the inflammation. It is in no disease more accelerated than in severe capillary bronchitis.

In pleuritis and pneumonitis, the respiration is accelerated in proportion to the extent and acuteness of the inflammation. Inspiration ending abruptly, and succeeded by an expiratory moan, is a symptom of both pleuritis and pneumonitis in their acute stages. In certain cases of irritative or inflammatory disease of the abdominal organs, respiration presents a similar character; it is modified in this manner in consequence of the pain experienced in movements of the diaphragm. Ordinarily, however, in abdominal diseases, respiration is nearly natural.

The cough is an important diagnostic symptom. It is loud and sonorous in spasmodic croup; hoarse or harsh in true croup; clear or distinct in bronchitis; suppressed and painful in the early stages of pneumonitis and pleuritis; convulsive, and with more inspirations than expirations, in pertussis. A cough is one of the first and most constant symptoms of measles; it is due to coexisting bronchitis. Typhoid and remittent fevers, difficult dentition, intestinal worms, irritating ingesta, and severe burns, sometimes give rise to a cough, which is nearly dry and painless. Occurring in such diseases, it is sometimes dependent on more or less bronchitis, to which the primary disease has given rise.

Circulatory System.

In all ages and countries the pulse has been considered an important symptom both in diagnosis and prognosis. It aids the practitioner in determining, approximatively, not only the character, but gravity of diseases. It is somewhat remarkable, from the importance which is attached to the pulse in medical practice, that its natural frequency and its character in infancy are not more accurately known. It is true that eminent observers, as Trousseau and Valleix, have published statistics relating to the infantile pulse in health, but these statistics disagree, and therefore do not afford a reliable standard with which to compare the pulse in disease. Moreover, some published statistics of the pulse possess but little value, from the small number of observations; some from the fact that records of the infantile pulse are grouped with those of older children; and others because the state of the infant, as regards its activity or emotions, is not mentioned.

PULSE IN HEALTH.—It is not easy to collect statistics of the healthy pulse for the period of infancy, which are entirely free from error, since there are often slight derangements of the system in the infant, which are not manifested by any marked symptoms, but which produce acceleration of the pulse. In collecting the following statistics, it was my endeavor to avoid sources of error so far as possible.

In ordinary cases the movements of the heart begin about one-eighth of a minute after birth. They are at first slow, the ventricular contractions not numbering more than eight or ten by the close of the first quarter minute. In the second quarter the cries are vigorous, and the pulse now is rapidly accelerated, rising commonly above 120, and sometimes above 160 beats per minute. In fifty-seven observations of the pulse in healthy infants during the first half hour of life, after the first quarter of a minute, I found that the extremes, with one exception, were 104 and 164—average 139.

Table of Infantile Pulse in Health.

	AGE.									
	First week.		From close of first week to close of first month.		From close of first month to close of third.		From close of third month to close of sixth.		From close of sixth month to close of first year.	
	Awake. Quiet; moving slightly; nursing.	Asleep.	Awake. Quiet; moving slightly; nursing.	Asleep.	Awake. Quiet; moving slightly; nursing.	Asleep.	Awake. Quiet; moving slightly; nursing.	Asleep.	Awake. Quiet; moving slightly; nursing.	Asleep.
No. of observation.....	22	16	10	10	15	17	25	6	20	3
Extremes......	104–152	108–140	124–160	104–144	112–148	104–132	112–146	104–116	112–144	
Mean..........	126	122	139	118	132	118	129	108	127	109

"M. Ledéberder," says Bouchut, "could only count the pulse in the first minute of life in six children, and he has observed from 72 to 94 pulsations." Valleix estimates the pulse, between the ages of two and twenty-one days, at 87. Trousseau states that the pulse, in the first week of life, varies from 78 to 150; and Dr. Gorham's observations are somewhat similar to Trousseau's. My observations, as seen from the above table, do not correspond with the assertions of Ledéberder and Valleix. Indeed, if there were no conflicting testimony, there would still be a strong presumption that these authors are in error, for we would not suppose that the pulse of the infant, in whom there is greater functional activity, both muscular and visceral, would fall so much below that of the fœtus. It is probable, from the expression "could only count the pulse . . . in six children," that Ledéberder and perhaps Valleix counted the pulse at the wrist, which, with exceptional cases, is very difficult and often impossible in the first week of life, and that they missed some of the beats, or, not unlikely, sometimes counted their own pulse. Immediately after birth there is so little force of the ventricular systole, and the extreme arteries, therefore, of the system pulsate so feebly, that neither in the limbs nor at the anterior fontanelle can the frequency of the pulse be readily ascertained. It can be readily and accurately ascertained only by auscultation, or by placing the hand on the precordial region, or directly after birth by the pulsations in the umbilical cord.

The average pulse of the healthy infant in the first and second months is, according to Trousseau, 137 per minute, 128 from the third to the sixth month, and 120 from the sixth to the twelfth month. It is seen that his observations agree closely with mine, as regards infants who are quiet but awake. One point of interest, established by the above statistics, is the great diminution in the frequency of the pulse in sleep.

Pulse during or after Active Movements or Great Mental Excitement.

	AGE.				
	First week.	Close of first week to close of first month.	Close of first to close of third month.	Close of third to close of sixth month.	Close of sixth month to close of first year.
	140	162	176	132	132
	160	156	152	148	144
	140	140	158	148	152
	152	152	144	144	152
			152	156	198
			180	156	160
Extremes.....	140–160	146–162	144–180	132–156	132–198
Mean.........	148	152	160	147	156

It is seen, by the above table, that by active exercise or great mental excitement the pulse may become as rapid as in grave diseases. There is greater acceleration of pulse from the emotions and from exercise in feeble than in robust children. Obviously, in order to determine to what extent the pulse is accelerated in disease, it is necessary that it should be counted during a state of quietude. As the age increases, it is less and less influenced by the emotions and physical exertion; still, during the whole period of childhood, such influences do have more or less effect on its frequency.

Pulse in Disease.—Febrile and inflammatory diseases produce greater acceleration of pulse in early life than in maturity. Diseases, or derangements of system, particularly those of the digestive organs, which do not materially affect the pulse in the adult, often cause acceleration of it in children. The febrile pulse of early life usually has exacerbations in its frequency. These commonly occur in the latter part of the day. Distinct and more or less regular febrile exacerbations and remissions are common in several diseases of early life, some of which are serious, while others involve little danger. Among these diseases may be mentioned difficult dentition, intestinal worms, incipient meningitis, and constipation. An intermittent and irregular pulse is common in fully developed meningitis and certain other severe organic diseases of the encephalon. It may be due also to disease of the heart, and it also occurs in some children from temporary disturbance of the digestive function. The pulse is slow in compression of the brain, and also in sclerema of the new-born.

Animal Heat.

The internal temperature of the body in a state of health is uniform. In 33 infants under the age of seven days, M. Roger found the average temperature 98°.6 Fahr., while in 25 from four months to fourteen years old it was 99°. The external temperature alone varies in a state of health, according to the temperature of the atmosphere.

Elevation of temperature above the normal standard is a sign of inflammatory and febrile affections. The increase of heat varies according to the character of the disease and its type. In favorable cases of inflammation and in simple fevers it is not ordinarily more than two or three degrees. The greater the severity and malignancy of inflammatory and febrile diseases, the greater the elevation. An elevation of more than six degrees indicates a form of disease which is likely to prove fatal. It is rare that the temperature, even in fatal cases, rises above 107°. In measles the temperature in the eruptive stage is from 101° to 103°; in scarlatina from 102° to 104°, if no complication exist.

Reduction of the internal temperature is an unfavorable prognostic sign; it is observed, a few hours before death, in infants who are greatly reduced by certain chronic diseases, as enterocolitis. In these cases the tongue and even sometimes the breath communicate to the finger or hand a sensation of coldness.

The importance of thermometric observations, as an aid to the diagnosis of children's diseases, is within a few years more fully recognized by the profession. Two diseases which, in their commencement, present very similar symptoms, often vary as regards the temperature. Thus, meningitis presenting in its first stages symptoms very similar to those of typhoid fever, has a lower temperature till an advanced period, when the amount of heat increases.

Digestive System.

Inspection of the buccal and faucial surfaces discloses some of the most frequent local diseases of infancy, as the various forms of stomatitis, and others which, though not frequent, involve great danger, as gangrene of the mouth, diphtheria, and retro-pharyngeal abscess. Inspection of the tongue aids in determining in many cases whether the disease is pursuing a favorable course, or has become asthenic, and is exhausting the vital powers.

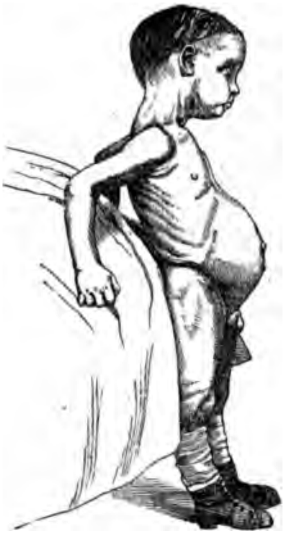
Febrile movements, even when slight, give rise to coating of the tongue, and intumescence and distinctness of its follicles. The eruptive fevers are attended by changes upon the buccal and faucial surfaces which possess diagnostic and prognostic value. Hyperæmia of these surfaces appears early in rubeola and scarlatina, prior to those phenomena which are justly regarded as pathognomonic. It is therefore often an important sign in the initial period of those diseases when the diagnosis is obscure. The appearance of the fauces in diphtheria and croup, indicating not only the nature of the disease, but its gravity, need only be referred to in this connection.

Inspection of the buccal and faucial surfaces sometimes enables us to form a probable opinion in reference to the nature of diseases which are seated in other parts. In the infant protracted stomatitis is a common accompaniment of chronic diarrhœa, and it indicates its inflammatory nature.

Vomiting is more frequent in infancy than in childhood, and in either period than in adult life. It is common in cerebral affections, and is one of the first symptoms of scarlet fever, and it is not uncommon, though less frequent, in the commencement of the other essential fevers and of acute inflammations. It is a symptom of indigestion, entero-colitis, cholera infantum, and intussusception; it is common, also, after the paroxysmal cough of pertussis, and not infrequent in the bronchial inflammations of young infants; in both which diseases it is excited by the muco-purulent matter upon the faucial surface.

Intestinal gas is in part secreted or exhaled from the mucous membrane, as the experiments of Hunter and others have shown, and it is in part the product of chemical changes in the food. A certain amount of gas in the intestines is normal; it subserves a useful purpose. An abnormal amount of it is common in various diseases, as indigestion, chronic entero-colitis, peritonitis, typhoid fever. It is a frequent cause of gastralgia and enteralgia in the infant. In scrofulous or feeble infants, with impaired muscular tonicity and faulty digestion, the abdomen is often habitually more or less distended with gas, which does not, under such circumstances, give rise to pain or other local symptoms; it has significance as showing the general condition of the child.

In the rachitic, whose thorax is compressed and liver often enlarged, while the vertebral column is shortened, the abdomen is commonly protuberant. In feeble children, not decidedly rachitic, whose lungs are seldom fully inflated, and whose chests are consequently depressed, the abdomen is also prominent. The accompanying wood-cut represents one of these cases, presented for treatment at the out-door department at Bellevue.



In feeble children who have suffered from repeated and protracted attacks of bronchitis, and whose chest-walls are consequently depressed, a similar abdominal prominence occurs.

Retraction of the abdominal walls is common in meningitis, and in many exhausting diseases. Tenesmus is a symptom of intussusception in the infant, and of colitis in children.

Much light is thrown on the character of intestinal diseases by the appearance of the stools. Muco-sanguineous stools, accompanied by fever, are a sign of colitis. Stools containing unmixed blood, and not accompanied by fever, may result from a rectal polypus and from purpura hemorrhagica. Scanty evacuations of blood with obstinate constipation, are a symptom of intussusception in infants.

The alvine discharges of infants often present a green color; sometimes they have the normal yellow hue when passed from the bowels, but become green on exposure to the air, or from reaction of the urine. By the microscope the green coloring matter is seen to occur in small irregular masses. This green substance has been supposed to be bile. I have satisfied myself that, as met in the stools of the infant, it is commonly produced by the action of the intestinal secretions on the contents of the intestines; perhaps the action is upon the bile which is mingled with the contents. I have often noticed the contents in and above the jejunum yellow, while in and below the ileum the color was green.

The green hue may occur from very different causes. It may be due to overfeeding, to the action of cold, to irritating ingesta, to inflammation, etc.; it may be transient, subsiding within a day or two, or it may continue several days. All infants, at times, have green evacuations, even when they appear in good health.

The alvine discharges of infants, in a large proportion of cases of diarrhœal affections, give an acid reaction with litmus paper. This acid, if in considerable quantity, is irritating, increasing the peristaltic movements of the intestines, and the functional activity of the intestinal follicles, causing erythema of the skin around the anus, and reacting upon and intensifying the intestinal disease. Hence the indication for the use of antacids in the diarrhœal affections of infancy.

The presence of intestinal worms, and the species, may be ascertained by microscopic examination of the stools of the child who is affected with these entozoa. The stools contain ova, which differ in size and shape according to the species of worm.

Nervous System.

Pain.—This symptom affords important aid to the physician in determining the seat and nature of the diseases of children. Pain in the head may occur in them from coryza involving the frontal sinuses, febrile movement in the commencement of an essential fever, or of inflammation of one of the organs of the trunk. Produced by such a cause, it abates in two or three days. If it is protracted, whether constant or intermittent, it is almost never neuralgic, as it so often is in the adult, but it is due to organic disease of the brain or meninges. Complaint, therefore, of headache in a child, without any apparent general cause, or local cause external to the cranium, should awaken solicitude, and, if the headache is protracted, the prognosis should be doubtful, even if other symptoms are absent.

Grave thoracic or abdominal inflammations in the adult are almost always attended by a corresponding amount of pain and tenderness; but in children these symptoms are often absent, or, when present, are often not commensurate with the amount of disease. Thus, entero-colitis of nursing infants is, in a large proportion of instances, almost free from these symptoms, and the same may be said of many cases of the form of pneumonia, which is common in young children, namely, that produced by extension of inflammation from the bronchial tubes and that from hypostasis.

Pain in the chest or abdomen, occasional or constant, continuing for weeks or months, unattended by symptoms of thoracic or abdominal disease, indicates caries of the vertebræ. Its most common seat is the epigastric, umbilical, or hypochondriac region. It is a neuralgia due to irritation of the sensitive root of one or more of the spinal nerves. It is a very important symptom to the diagnostician, showing the nature of the disease, which in its incipiency is so obscure. Pain in the leg, especially the inside of the knee, is of a similar character, indicating disease of the hip-joint.

Children with certain acute febrile and inflammatory diseases sometimes have hyperæsthesia of portions of the surface, especially marked upon the anterior aspect of the trunk. The physician might be misled into the belief that the tenderness indicated the seat of the disease; but the pain of hyperæsthesia can be determined by the fact that it is so extensive, is less on firm than light pressure, and is especially observed upon the inner surface of the thighs. The symptoms pertaining to the nervous system present in the various diseases treated of in this book will be fully described in connection with those diseases, and, therefore, need not detain us in this connection.

PART II.

CONSTITUTIONAL DISEASES.

SECTION I.

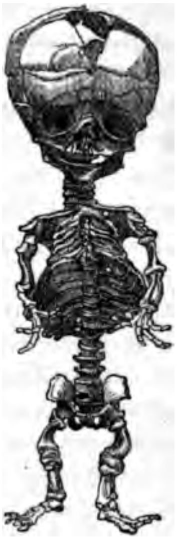
DIATHETIC DISEASES.

CHAPTER I.

RACHITIS.

Rachitis, or rickets, is a disease of the general nutritive process; but the structural changes which attend and characterize it are most conspicuous in the bones.

Age.—Rachitis commences in most instances between the ages of six months and two years. Now and then we meet cases of its earlier as well as later commencement, and skeletons are preserved in museums, which, it is claimed, establish the fact that in rare instances rachitis is congenital. Virchow alludes to such a specimen in the Wurzburg Museum, and Ritter von Rittershain describes another in the Museum of the Franz Joseph Hospital in Prague. In the Wood Museum of Bellevue Hospital is a similar skeleton presented by myself. The infant in this case died a few hours after birth, of atelectasis, apparently produced by the contracted state of the thoracic walls. This skeleton exhibits most of the curvatures and deformities which occur in rachitis, but as the nodosities of the articulations are wanting, and the bones, apart from their general shape, appear normal, competent pathologists of this city have expressed the opinion that the malformation in this case was probably the result of some unknown error of nutrition rather than rachitis. The annexed representation will allow the reader to judge for himself. The parents are



hard-working English people, having children who appear scrofulous, but not rachitic.

Enlargement of the costo-chondral articulations, known as the "rachitic rosary," which is one of the earliest and most reliable signs of rachitis, has been observed, though rarely, in infants of two or three months. It should not, however, be regarded as a sign of rachitis unless the enlargement is so great that it can be readily appreciated by examination through the integument or by sight, for in young children, with the bones in the process of normal development, these points always have a greater diameter than that of the ribs. After the age of two years the number of those affected with rachitis gradually becomes less as we pass towards manhood.

Published statistics relating to the commencement of rachitis have been derived chiefly from European hospitals. Of 521 cases observed by Ritter von Rittershain, 266 were under the age of twelve months, and 91 under six months. Of Hillier's cases, 7 were six months old or under, 27 from six to twelve months, 40 from twelve to twenty-four months, 40 from two years to four years, and 3 over the age of four years. As rachitis so often commences insidiously, these statistics must be considered only approximately correct, especially as regards those cases which are supposed to have had an unusually late commencement.

Is rachitis ever developed in the adult? Osteo-malacia, or mollities ossium, a rare disease of adults, occurring with few exceptions in women after childbirth, resembles rachitis, since it is attended with softening of the bones from the absorption of their calcareous element. Trousseau, and following him, Bouchut, believe in their essential identity, regarding their differences as due to the difference in age, and especially to the fact that in osteo-malacia the bone has attained its growth, whereas in rachitis it is still growing. Moreover, as arguments in favor of their close relationship, rachitis and osteo-malacia are found to require very similar treatment, and women after childbirth resemble children as regards aptitude for disease. That the two pathological processes are not, however, exactly identical, appears from the researches of Virchow. In osteo-malacia the bones become soft and flexible from absorption of the lime salts, whereas in rachitis there does not appear to be any more loss of the lime than occurs in the normal growth of bone, but its further deposit is arrested. In the normal development of bone the deposit of lime is in excess of the absorption, but in rachitis, the absorption continuing, with an arrest of deposition, it is easy to see how the bone soon becomes soft and yielding, as in osteo-malacia, with enlargement of its canals and cancelli.

Causes.—Rachitis, as we have stated elsewhere, is entirely distinct in its nature from scrofula. The scrofulous are not likely to become rachitic, nor the rachitic scrofulous. Proneness to low grades of inflammation or to hyperplasia of the lymphatic glands, which characterizes scrofula, seldom exists in connection with swelling of the bones or other manifestations of rachitis. The differences between the scrofulous and rachitic diatheses, which indeed seem to exclude each other, are marked. The scrofulous are well developed and of good height, as a rule, while the rachitic are stunted. Scrofula manifests itself not less frequently in childhood than in infancy, whereas rachitis we have seen is especially a disease of infancy. Again, as showing the difference between the two, scrofula is not infrequently associated with tuberculosis, whereas rachitis with tuberculosis is rare.

Residence in a cold and moist climate, or in dark, damp, and ill-ventilated apartments, is a cause of rachitis. Therefore it is more common in the north of Europe than in the warm and equable climate of southern Europe; in the damp and dark basements and alleys of the city, than in dry and airy country residences. In deep valleys, shut out from the solar rays, rachitis is more common than among people of the same habits and social position living in elevated and sunlit localities.

A common cause of rachitis is the use of insufficient or improper food. This has been ascertained not only from the history of rachitic children, but from experiments on animals. Diminution in the relative amount of lime and consequent softening of the bones have been produced in various animals by the use of scanty food, or food deficient in nutritive properties. Artificial feeding of young animals at the time when nature designed that they should be nourished by the mother's milk has had the same result. (Experiments by M. Jules Guerin and others.) Rachitis is more apt to occur in those who are prematurely weaned than in those who nurse the full time. Those are most likely to become rachitic in a marked degree, even fatally, who at the same time have scanty and improper food, and reside, in damp, dark, and insalubrious localities.

An hereditary predisposition to rachitis must also be admitted, since infants born of rachitic parents are more likely to become rachitic than are those of healthy parentage. The mothers presented traces of rachitis in 27 out of 71 cases observed by Ritter von Rittershain. A mother in habitual ill-health and poorly nourished, though without actual disease during the period of gestation, is more apt to have rachitic offspring than is a mother whose health is habitually good.

It is not true, as some have stated, that all that is required to produce rachitis is a certain lowering of the vital powers, since all greatly enfeebled infants would become rachitic, whereas only a portion of such present the anatomical changes which characterize this affection. Cachexia is, however, the important element in its causation, and therefore the rachitic state not infrequently supervenes on certain exhausting diseases, as the eruptive fevers, pertussis, and entero-colitis.

ANATOMICAL CHARACTERS. *1st Stage.*—M. Lebert says: "In rachitis the bone is diseased in all its histological elements, and the skeleton in its totality." It commences with proliferation of the periosteum and of the cartilages of the epiphyses. In the normal state the new tissue formed by this proliferation changes into bone by the deposit of the lime salts, that formed from the periosteum increasing the thickness of the bone; that from the cartilages, their length; but in rachitis, as already stated, the osseous change does not occur. Soon the areolæ, which abound in the ends of the long bones, in the short bones, and in the diploë of the flat bones, are observed to enlarge, and the laminæ of which the compact bone is composed, to separate more or less from each other, forming interlamellar spaces.

The areolar and interlamellar spaces are filled with a gelatiniform fluid of a pale reddish color. The same substance fills the medullary canals, and, in certain situations, more or less of it is deposited between the periosteum and the external surface of the bone. The amount of subperiosteal deposit in a given place, depends in a measure on the tensity and degree of adherence of the periosteum. Thus when curvatures occur, the quantity of this substance deposited over the concave surface of the bone, where the periosteum is lax, is considerable, while over the convex surface, where it is tightly drawn, it is absent or scanty. This substance adheres quite firmly to the surface of bone, with which it is in contact, though at autopsies more or less of it can be washed away by a stream of water.

The periosteum and medullary membrane are more vascular than in their normal state, presenting a deep red color, and the vascularity of the bone itself is increased.

2d Stage.—The second stage is that of curvatures and deformity. The laminæ of compact portions, and the walls of the areolæ, in parts that are cancellous, become gradually thinner and more yielding. Here and there loss of the animal matter in connection with the mineral, occurs, producing new apertures and channels, in some of which bloodvessels of a new growth are developed. Occasionally portions of bone become detached, and lie as sequestra in the midst of the gelatiniform substance. The shape of the medullary cavity changes. The extremities of the cavity are considerably larger than its central portion. In this second stage, in typical cases, the relative proportion of calcareous matter being greatly reduced, and the new gelatiniform substance still semiliquid, if an opportunity occur of examining the skeleton, the long bones can be bent, and their epiphyses, as well as the flat and short bones, compressed, and, in some instances, even crushed between the thumb and fingers. "The bones in this state can be cut with a knife with as much ease," says Trousseau, "as a carrot or other soft root. In cases in which the absorption has been considerable, if the bone removed from the cadaver is dried, it will be found possible to respire through it, so great is its porosity, and its weight is from six to eight times less than that of normal bone.

If rachitis commence at an age, as it commonly does, when the diaphyses and epiphyses of the long bones are united by cartilage, this cartilage not being transformed into bone increases in extent and undergoes molecular changes, which have been minutely described by M. Broca. According to him, as we examine the cartilage beginning at the epiphysis, we find first a layer of cartilage which is but little changed, containing cells in their normal state. Nearer the diaphysis we find cartilage perforated with small holes, the cartilage cells, instead of being distinct, being arranged in longitudinal groups, in other words, lying in longitudinal cavities, and flattened by mutual pressure. Near the diaphysis bands of fibrous tissue surround the clusters of cells.

While the anatomical changes, described above, are occurring, the ligaments, which unite the bones, become gradually lengthened and relaxed, so that there is increased mobility of the bones upon each other.

The deformities which occur in the second stage vary in degree in different cases, according to the amount of rachitic softening and tumefaction of the bones, and relaxation of the ligaments, on the one hand, and the movements of the patient on the other. If the patient is old enough to walk, the curvatures ordinarily occur first in the lower extremities; but if too young to walk, in the upper extremities.

Craniotabes.—Occasionally the cranial bones in rachitis become very much thinned and softened in places, to which the name of craniotabes has been applied. This thinning occurs most frequently in the occipital bone, and sometimes to such an extent that the dura mater and pericranium are nearly in contact. The soft spots are yielding when pressed upon, and in the cadaver they are seen to be translucent when held to the light. Craniotabes has been invested with considerable pathological importance, chiefly through the writings of Dr. Elsässer, more it is now believed than is warranted by the facts.

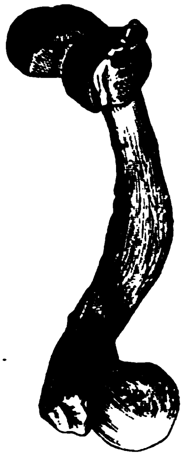
The changes in the shape of the head in rachitis are characteristic, and are so manifest as at once to attract attention. The growth of the cranium is not retarded like that of other parts of the system, and in some patients its volume is greater than the normal size. If there is considerable cranial development, hypertrophy or hydrocephalus commonly coexists. The rachitic skull does not always present the same shape. It may be elongated, but more frequently it approximates to a square shape. It is more or less flattened superiorly, laterally, anteriorly, and posteriorly. The sutures, which are late in closing, are commonly depressed, while the frontal protuberances are unusually elevated. Elevation of the sutures in ridges has been observed in exceptional cases, as also flattening limited to one plane of the head, or greater in one than in the others, so as to destroy the symmetry of the cranium.

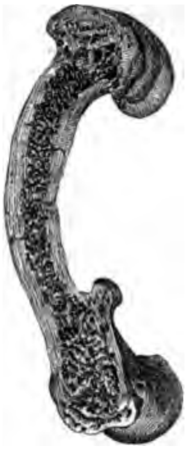
The deformities of the trunk and limbs occurring in the second stage are interesting. There is lateral depression of the thoracic walls between the second or third and ninth ribs, accompanied by projection of the sternum. The shape of the chest resembles that of the prow of a ship, to which Glisson likened it, or the breast of a bird. This deformity is the result of atmospheric pressure, occurring externally upon the thoracic walls during inspiration, at the time when the ribs are most softened, and least elastic. Depression of the first and second ribs is partially prevented by the support which they receive from the clavicles. The length of the clavicles is, however, somewhat diminished, and their curvatures increased, so that the shoulders approach each other. Below the ninth ribs the thoracic walls are expanded; the corresponding ribs on the two sides are more separated from each other than in their normal state. The expansion of the base of the chest diminishes the convexity of the diaphragm, and causes depression of the liver and spleen.

The abdomen in rachitis is protuberant, partly on account of the depression of the liver and spleen, partly on account of the spinal curvatures and shortening of the trunk, but chiefly on account of the fact that in this disease the intestines are distended with gas. The meteorism gives rise to tympanitic resonance on percussion, except occasionally over the lower part of the abdominal cavity, where there may be dulness from serous effusion.

Spinal curvatures, to which allusion has been made, are common in rachitis. They are due to softening of the intervertebral cartilages, and the bodies of the vertebræ, and to laxity of the intervertebral ligaments. Their direction is commonly antero-posterior. They are distinguished from the deformity of caries by the absence of an angular projection. Moreover, except in cases of long continuance, the curvature can be removed by placing the patient in a horizontal position, and pressing with the fingers on the projecting parts. The pelvic bones also undergo change of shape. There is expansion of the upper part of the pelvic cavity, from the pressure of the abdominal viscera, corresponding with the expansion of the lower part of the thorax, though not in as great degree, while the lower part of the pelvic cavity is contracted.

The bend of the humerus is such in most patients that its concavity looks inwards and forwards, but occasionally it is directly the opposite. The concavity upon the forearm corresponds with the palmar surface of the hand. The concavity of the thigh presents towards the median line and a little posteriorly. The natural bend of the femur being simply increased. The curvatures of the tibia and fibula vary in different cases. If the infant has not walked,





their concavity is commonly directed forwards and inwards; but if it has walked, outwards and backwards. Occasionally, the direction of the bend on one side differs from that on the other.

3d Stage.—The third stage is that of reconstruction. After a variable period, depending on the severity of the disease and the state of the constitution, the gelatiniform substance becomes more consistent, and points of calcareous matter appear here and there within it. The deposit of lime-salts continues, and the newly-formed bone again becomes firm and unyielding. It is generally cancellous in places where the original bone was of this character, though the extent of the new cancellous structure is apt to be different from that in the normal bone. Thus not only are the epiphyses cancellous in the new as in the original bone, but I have seen the entire medullary cavity filled with cancellous structure. The sub-periosteal deposit is sometimes also transformed into cancelli. This was the character of the change occurring under the pericranium in one specimen which I examined. Where the original bone was compact, the reconstructed bone is usually of the same character, as, for example, in the shafts of the long bones. Compact portions of the reconstructed skeleton have been said to lack the elements of true bone; they are osteoid, according to this theory, and not osseous, resulting from petrifaction of the gelatiniform substance. I have, however, found the elements of true bone in the skeletons of two individuals who had well-marked rachitic curvatures. The portions examined were removed from the concavities of the long bones, where there had been decided bending and thickening of the shafts from the large amount of rachitic deposit. In both specimens the osseous corpuscles (*lacunæ*) and Haversian canals were easily demonstrated; but in both there had been considerable growth of the bones since the rachitic period, and perhaps the portions which were examined belonged to this subsequent growth. Whether or not true bone is produced in the third stage of rachitis, that is, from the deposit of calcareous salts, which immediately succeeds the softening, certainly in the subsequent growth there is the formation of true bone.

Such is a brief sketch of the changes which the skeleton undergoes in ordinary cases of rachitis. An extreme degree of softening may be reached in four or five months, or not till the lapse of a year or more. The third stage, or that of consolidation, lasts one or two years. While in the first and second stages there is an arrest of ossification, and a deficiency of calcareous salts in the system, there is often in the third stage, as Lebert has stated, an exuberance of ossification, and a superabundant deposit of the salts of lime, so that the reconstructed bone is firmer and stronger than normal bone.

Occasionally, in reduced states of system, the third stage does not occur. The bones remain very soft and flexible, consisting almost entirely of animal matter. This is what has been designated rachitic consumption of bone. Such cases end fatally after a variable time.

A not unfrequent accident in the second period of rachitis is fracture in the shafts of the long bones. If there is almost complete removal of the mineral substance of a bone, so that the periosteum incloses little except the gelatiniform deposit, and the animal matter of the old bone, the limb bends readily, and no fracture occurs. If there is not so complete absorption, the weight of the body or muscular exertion snaps rather than bends the weakened shaft. From the nature of the fracture, crepitation can rarely be produced. The callus is not generally abundant, and reunion of the bone is slow. Many cases of rachitic fractures are partial, portions of the shaft deprived of the mineral element bending, while the part which retains this element is fractured.

Rachitis retards the evolution of the teeth. If the disease commence as early as the fifth or sixth month, no teeth commonly appear till after the age of twelve months; if certain teeth have appeared prior to the rachitic disease, an interval of several months elapses before the next are cut. Teeth which are developed during the rachitic state are frail, and deficient in enamel. They become black and carious early, and loosen in their sockets. If there is no tooth at the age of twelve months, the infant is probably rachitic. The fontanelles and cranial sutures remain open longer than in healthy infants. The former may not close till the third or fourth year, and the latter not till the second or third year. Patency of the anterior fontanelle after the age of twenty months indicates rachitis.

Although the prominent and most interesting lesions of rachitis occur in the bones, anatomical changes, resulting from the disease, occasionally occur in the soft parts. The lymphatic glands, liver, spleen, and some other organs not infrequently undergo waxy degeneration, diminishing greatly the chances of recovery. Whether this degeneration results from the diathesis directly, or is due to the bone disease, the substance which is produced is now mitted to be the true waxy material, though for a time denied, it does not always give a clear reaction with iodine.

Rachitis influences the future growth of the skeleton. The long ones, though unusually thick and firm, do not attain the normal ongitudinal development; therefore the child of ten years, who has had rachitis, is scarcely taller than one at six who has not been thus affected. In many patients the curvatures in the course of time gradually diminish, so that in youth and maturity the body is less misshapen than at the age of two or three years. It is rare, however, that the deformities entirely disappear.

It is seen that the anatomical characters of rachitis resemble, in certain respects, those pathological processes which are admitted to be of an inflammatory nature. The tenderness, hyperæmia, proliferation, and consequent thickening of the periosteum, and the proliferation of the epiphyseal cartilages, are perhaps inflammatory, since they resemble more closely the lesions of inflammation than any other recognized pathological state. The soft substance, which is produced so abundantly in places underneath the periosteum and in the spaces of the bone, is perhaps in part an exudation, and in part the animal matter which is formed in the normal development of the bone. The immediate cause of the elimination of the lime salts from the kidneys, and the consequent arrest of ossification of the skeleton, is unknown, but it has been suggested that as a large proportion of the rachitic suffer previously from indigestion and diarrhœa, with the formation of acids in the primæ viæ, especially the lactic, an acid in the blood holds the lime in solution, and hence its elimination. But however plausible this theory may appear, it lacks demonstration as yet.

SYMPTOMS.—The patient in incipient rachitis is quiet and melancholy, shunning caresses or attempts to amuse him, since movement of his body increases his suffering. He has general tenderness, due in part to the morbid state of the periosteum, and in part to hyperæsthesia. The rachitic infant, therefore, unless very mildly affected, will evince anxiety and dread even at the approach of one, through fear of being touched or moved. Trousseau says "this change in the character of the infant, the fear which it experiences of seeing its sufferings return, which the pressure of another's hand causes, this habitual sadness impressed upon its features, differs from that which we observe at the commencement of other maladies, especially from that in the prodromic period of cerebral fevers. In truth, in an infant over whom this last and cruel affection is impending, we are able to excite again a momentary cheerfulness; we are able, by exciting actively its spirits, to make it turn temporarily from this melancholy languor, which constitutes its habitual state. It is not thus in the rachitic; the more you desire to arouse it, the more you solicit its movements, the greater will be its impatience. It is indifferent to the plays which it previously loved. This * * * habitual sadness in an infant, who, with an appetite rather augmented than diminished, sensibly emaciates, who has constantly acceleration of pulse coincident with profuse perspiration, these symptoms, I repeat, have positive significance when the infant does not cough or present any of the signs which induce us to believe in the occurrence of tubercular phthisis."

Febrile movement, manifested by acceleration of pulse, is common, although, in most cases, there is no decided exaltation of the external temperature, perhaps in consequence, in part at least, of the free perspiration to which these patients are subject.

A bruit de soufflet of greater or less intensity, synchronous with the pulse, has frequently been heard in rachitic cases, when the ear was applied over the anterior fontanelle. Drs. Fisher and Whitney, New England physicians, first called attention to this murmur, believing it to be a sign of chronic hydrocephalus. MM. Rilliet and Barthez heard it in cases of rachitis, and therefore concluded that the American observers had mistaken the rachitic for the hydrocephalic head. Later observations have established the fact that this murmur possesses little diagnostic value. It is heard in healthy as well as diseased infants. Dr. Wirthgen detected it 22 times in 52 children, all of whom, except 4, were in good health. I have auscultated the anterior fontanelle in 29 infants, who were, with two exceptions, between the ages of three and thirty months. Most of them were well, or with trivial ailments, which would not affect the cerebral circulation. In most infants with a patent fontanelle a murmur can be distinctly heard synchronous with the respiratory act, and in 15 of the 29 cases no other bruit could be detected, while in the remainder, namely 14, a bruit synchronous with the pulse was heard at the fontanelle.

The rachitic, as stated above, are liable to perspirations, which are profuse about the head and neck, so as to moisten the pillow on which they lie. The respiration is more or less accelerated except in the mildest cases, in consequence of the flexibility and diminished elasticity of the ribs, and the lateral depression of the thoracic walls, which prevent full inflation of the lungs.

The urinary secretion is abundant, like the perspiration. During the first and second periods it contains a large amount of the calcareous salts, since the lime which enters the system with the ingesta, and which, in the normal state is expended in the growth of bone, is eliminated from the system by the kidneys.

The appetite in the beginning of rachitis is good, sometimes even better than in health, but it gradually diminishes, as the disease increases in severity, till it is entirely lost. Diarrhœa alternating with constipation is common. With the continuance of febrile movement and loss of appetite, the patient soon begins to lose flesh, emaciation in the second stage being a prominent symptom.

Since the rachitic patient sits or lies quietly, unable or disinclined to make exertion, the muscles become small and flabby from disuse. Deposition of fatty matter may occur between the primitive muscular fasciculi.

Rachitis in the female infant is attended by one serious consequence, namely, narrowing of the pelvic cavity, from the thickening, change of shape, and imperfect development of the pelvic bones. Rachitis, therefore, in the female greatly increases the danger of child-bearing, and may render it impossible.

Complications.—Rachitis is often attended by certain serious complications, the most common of which are inflammatory affections of the respiratory apparatus. Bronchitis is one of the most common diseases during the age at which rachitis occurs, and even a mild form of it involves great danger if the ribs are soft and flexible or the thorax have the rachitic deformity. In these cases, since full inflation of the lungs is prevented, collapse more or less complete of certain of the lobules is apt to occur, increasing the amount of dyspnœa, and therefore diminishing the chances of recovery; hence bronchitis is very fatal in infants who are decidedly rachitic.

Imperfect digestion of food, and unhealthy alvine evacuations, common in rachitic children, frequently cause diarrhœa, and, after a time, intestinal inflammation. The diarrhœa, especially if it has become inflammatory, is apt to be obstinate and dangerous, the patient becoming emaciated and feeble.

Internal convulsions, the so-called laryngismus stridulus or spasm of the glottis, has been observed in so large a proportion of cases, that its occurrence in rachitis must be considered something more than mere coincidence. Elsässer believed that he had discovered the cause of the laryngismus in craniotabes, but later observations have failed to establish the correctness of his views. Hypertrophy of brain, and chronic hydrocephalus, are also occasional complications. In cases of great deformity of the chest from rachitis, in which the lungs are more or less compressed, the pulmonary circulation is retarded and imperfect. This gives rise to congestion of the right cavities of the heart, with hypertrophy of this organ, and congestion of the hepatic veins, liver, and portal system. Congestion of the portal system may be regarded as a cause of the diarrhœal attacks.

Diagnosis.—Diagnosis is easy except in incipient or slight cases. The lesions which pertain so largely to the skeleton are readily detected. Beading of the costo-chondral articulations occurs early, and is apparent to the sight. Enlargement of the joints of the limbs, arrested dental evolution, the state of the anterior fontanelle, the peculiar shape of the head, the sternal projection, and rachitic curvatures, indicate positively the rachitic state. Profuse perspiration upon the head and neck, and the general tenderness of the patient, as evinced by his cries when moved or disturbed, are also important diagnostic signs.

Prognosis.—The prognosis is favorable, as regards life, if rachitis is recognized at an early period, and properly treated. The vicious nutritive process may be arrested, and the patient recover with but slight deformity. If curvature of the long bones has occurred, and the head and thorax are misshapen, the patient under favorable hygienic conditions commonly recovers from rachitis, but with permanent deformities.

If there is that degree of spinal curvature in the dorsal region, and depression of the ribs, that respiration is, habitually, more or less accelerated and embarrassed, on account of compression of the lungs, the prognosis is unfavorable, since bronchial or pulmonary inflammation, occurring in this condition, is apt to be fatal. If there is much emaciation, and especially if diarrhœa is present, or of frequent occurrence, the prognosis should be guarded. In these cases there is probably waxy degeneration of important organs, which cannot be remedied.

Treatment.—The correct treatment of rachitis is obvious when we consider its character and the nature of its causes. The indication is to restore healthy nutrition. This requires both hygienic and therapeutic measures. The apartment in which the child resides should be dry, airy, and plentifully supplied with light. He should be taken daily into the open air, in order to invigorate his system, but in such a way as not to increase his suffering, in consequence of his general tenderness. The diet should be appropriate for the age. It should be bland and easy of digestion, and, at the same time, sufficiently nutritious. Cleanliness of person and apartment, and clothing sufficient to protect from vicissitudes of temperature, are requisite. The rachitic patient of the city should, if practicable, be removed to a well-selected locality in the country.

The medicines which are of undoubted efficacy in rachitis are cod-liver oil, and the vegetable and ferruginous tonics. Cod-liver oil should be administered in cases in which the digestive function is not seriously impaired. If the oil is not readily digested, if it diminish the appetite, or if the patient is affected with diarrhœa, it should not be administered. Positive harm may, under such circumstances, result from its use.

The citrate of iron and quinine, wine of iron, iodide of iron, the various preparations of cinchona, columbo, etc., are the medicines which, with or without cod-liver oil, are best calculated to restore healthy nutrition. When complications arise, the treatment should be modified to meet the exigencies of the case. Most of the diseases which occur as complications require treatment similar to that which is appropriate in their idiopathic form, but all measures of a depressing nature should be avoided.

CHAPTER II.

SCROFULA.

The term scrofula (*scrofa*, a pig, from the resemblance of the enlarged cervical glands of a scrofulous individual to a swine's neck) is applied to a diathesis which is characterized by increased vulnerability of the tissues (Virchow). The nutritive process of the tissues is readily disturbed even by trifling irritants or agencies in those who possess this diathesis, and therefore the scrofulous are very prone to hyperplasia of the lymphatic glands, and inflammations of various parts. Inflammations which can properly be considered as dependent upon this diathesis are, for the most part, subacute or chronic, and they are apt to occur in tissues which are seldom inflamed in those who possess a sound constitution. Inflammation of a scrofulous nature differs from ordinary inflammation in the fact of a greater cell formation, and greater liability to cheesy degeneration of the inflammatory products. Moreover, the diathesis often modifies those inflammations to which all persons are subject whether scrofulous or non-scrofulous, as coryza or bronchitis, rendering them more protracted and less amenable to the ordinary treatment.

Scrofula is a disease chiefly of infancy and childhood. Manhood, especially the first years of it, is not entirely exempt, but scrofulous manifestations after the age of twenty are feeble and infrequent, disappearing entirely as the individual advances towards middle life. The diathesis is most active prior to the age of ten years.

CAUSES.—Scrofula is congenital or acquired. Parents who had scrofulous symptoms in early life, or who are in a state of decided cachexia, as from cancer, syphilis, intermittent fever, or tuberculosis, are apt to beget scrofulous children. Insufficient nourishment of the mother during a considerable part of her gestation, and advanced age, and therefore feebleness, of the father, are occasional causes. Near blood relationship of the parents is recognized as a cause by most who have written on this diathesis, and to this fact has been attributed the scrofula of royal families, though probably with insufficient proof.

Again, those born with sound constitutions may acquire scrofula through anti-hygienic influences in the first years of life. Among the poor of New York we often observe one child in the family who presents scrofulous symptoms, while the rest of the children are well, and in many cases we are able to trace back the diathesis to some depressing cause or causes, which were sufficient to effect the peculiar change in the molecular condition of the tissues which constitutes this disease. Obviously the causes of acquired scrofula are quite numerous. In the infant it is sometimes produced by insufficiency or poor quality of the breast milk, or the use of artificial food during the period when breast milk is required. Too protracted lactation also, especially if artificial food is almost wholly withheld, may cause it, as may also, in those who have passed beyond the age of lactation, the continued use of a diet which is deficient in nutritive properties.

Residence in damp, dark, and filthy apartments or streets may also produce it. Hence, one reason of its frequent occurrence among the city poor. Residence in a small, crowded, and imperfectly ventilated apartment has been known to produce it, even with personal cleanliness, and a diet sufficiently nutritive.

Scrofula may also be produced in those previously robust and of sound constitution, by diseases of an exhausting nature. The eruptive fevers, as smallpox, measles, and scarlet fever, if severe, occasionally have this result, or they render active the diathesis, which had hitherto been latent. In this city, where chronic entero-colitis of infancy is common, I have sometimes been able to trace the diathesis to it.

Can a child affected with scrofula communicate it to others? Does scrofula possess a peculiar principle, a *materies morbi*, which is communicable to others? No one believes in the infectiousness of scrofula, but there is a strong popular belief that it is communicable by contact, and some good pathologists and high authorities in children's diseases are inclined to believe that the popular opinion does have some foundation in fact. M. Bouchut, who holds that the scrofulous and tubercular diatheses are identical, says of scrofula that it has not been shown to be inoculable. "Nevertheless, if its contagiousness has not been demonstrated, we are not able to say that it will not be some day. The facts of vaccinia followed by impetigo, by scrofulous ophthalmia, and enlargement of the cervical glands attributed to the inoculation of scrofulous vaccine virus, and those of the contagion of phthisis by constant cohabitation, demand, at least for the present, a certain reserve."

But scrofula differs widely in its nature from those diseases which are known to be communicable by infection or contact. It presents no analogy with them. We would not suppose, apart from observations, that a diathesis which consists in such a state or constitution of the tissues that they are easily wounded, possessed any inoculable principle, and, in my opinion, observations go to show that no such principle exists. How often do we observe children with scrofulous coryza, otorrhœa, or scrofulous cutaneous eruption, associating with others without communicating the diathesis?

Vaccination, however, affords the best opportunity for determining whether scrofula is inoculable, and the very prevalent opinion of non-professional people, that it may be communicated and established through this operation, should have due weight. For it may be stated, as a rule, that a wide-spread popular belief in reference to a disease, which has external manifestations, does have some foundation in truth.

The following are the facts in reference to this matter:—

1st. It is the almost unanimous opinion of the most experienced vaccinators that pure vaccine lymph taken from a vesicle prior to the eighth day, never communicates anything but vaccinia. When another disease, as syphilis, is communicated by the use of the lymph, it is through the blood, which has been mixed with the lymph by careless puncture of the vesicle. This opinion, so strongly established by observations, also commands assent from its reasonableness.

2d. Vaccination of those who are decidedly scrofulous with virus from a healthy child, especially if the scab is employed, not infrequently produces a sore which becomes covered with a thick and irregular crust, consisting in part of inspissated pus, and the sore is long in healing. In the scrofulous, also, impetiginous eruptions are apt to arise around the vaccine sore, and the axillary glands to become tumefied on the side corresponding with the vaccination. This gives rise to the belief on the part of friends that impure virus has been used, and scrofula communicated, while the fault is in the constitution of the child itself. The tumefaction of the glands, and the primary and secondary sores, gradually disappear, in most cases, leaving no ill effects, and with no subsequent manifestations of disease.

3d. The vaccine crust from a decidedly scrofulous child, as it contains more or less animal matter, and is often pale, irregular, or broken, inserted in the arm of a healthy child, not infrequently produces an immediate inflammation with suppuration, so that the vaccine vesicle, if it forms, is soon broken, and an irregular sore and crust result, which present none of the appearances observed in the uncomplicated vaccine eruption. A simple inflammation, produced by the pus or other products contained in the scrofulous scab, has coexisted with, and modified, the specific eruption. The sore heals gradually, and impetiginous eruptions may occur around it, but no struma remains or is communicated.

4th. Scrofulous manifestations sometimes appear for the first time after vaccinia, but they appear also after those analogous but severer eruptive fevers, namely, measles, scarlet fever, and small-pox. Those infectious exanthematic diseases which profoundly affect the constitution, it is admitted, may be a co-operating, if not a main, cause of scrofula, and is there anything unreasonable in the supposition that vaccinia may have occasionally a similar effect, though less frequently or in a less degree, in proportion as it is milder? From my own observations, I am of opinion that vaccinia, not vaccination, may occasionally awaken to activity the scrofulous diathesis, or, in combination with other causes, may even produce it in those who previously possessed sound constitutions. It is a well-established fact, in the etiology of diseases, that causes which, in themselves, are entirely inadequate, or even insignificant, frequently produce disease in a system which other agencies have already prepared for it. Thus an excoriation gives rise to erysipelas, or a slight exposure to cold produces rheumatism. And so in those cases in which the friends have charged the production of scrofula upon vaccination, it has seemed to me that the most that could, with truthfulness, be alleged, was that the constitutional disease which had been produced by the operation, namely, vaccinia, was a subordinate, but, under the circumstances, a sufficient cause.

The following is the most striking case of the apparent communication of scrofula through vaccination which I have met: D——, West Fortieth Street, residing in a tenement-house, had no scrofulous affection, and was considered healthy till the age of eleven years. The remaining children of the family have never exhibited scrofulous symptoms. At the age of eleven years this boy was vaccinated from a scab, the source of which was not known, but by a physician whose practice was chiefly among the city poor. The sore produced was long in healing, and, before it had healed, the axillary glands, and those of the face and neck, began to be prominent and hard. From this time to the present, a period of six years, these glands have remained so large as to constitute a deformity, and certain other groups of glands, as those in the left infra-clavicular region and right groin, have undergone a similar hyperplasia. Examination of the blood by the microscope shows the absence of leucocythæmia. This case, at first view, certainly appears to be an example of the communication of scrofula through vaccination, and, for a time, I could interpret it in no other way. But when we recollect the facts already stated, namely, the improbability of the communicability of a diathesis of such a nature, how frequently scrofula is acquired by children of the tenement-house population, solely through the anti-hygienic conditions in which they live, the large number of scrofulous children in the crowded quarters of the poor, many of which have external ailments so that the conditions of its communication are present if it were in any way contagious, when, I say, we recollect these facts, is it not probable that cases like this, which are certainly rare, are to be explained in the manner indicated above, and that scrofula is not transmissible by vaccination. The facts, therefore, if they do not prove a lack of contagiousness, at least render it probable.

Anatomical Characters.—There are no ascertained anatomical changes in the blood which are peculiar to scrofula. As long as the appetite and general health remain good, and the local affections have not occurred, the composition of this fluid is, so far as known, unaltered. In the cachexia, which occurs when the general health is impaired, the blood becomes impoverished, the red corpuscles lose a portion of their coloring matter, and the watery element predominates.

Does the glandular hyperplasia of scrofula produce an excess of the white corpuscles? Virchow says (Cellular Pathology, Lect. IX.), "During the progress of an attack of scrofula, in which, if the disease run a somewhat unfavorable course, the glands are destroyed by ulceration, or cheesy thickening, calcification, etc., an increased introduction of corpuscles into the blood can only take place as long as the irritated gland is still, in some degree, capable of performing its functions, or still continues to exist; as soon, however, as the glands are withered or destroyed, the formation of lymph cells likewise ceases, and with it the leucocytosis. In all cases, on the other hand, in which a more acute form of disturbance prevails, connected with inflammatory tumefaction of the gland, an increase of the colorless corpuscles always takes place in the blood." Although the glandular hyperplasia occurring in scrofula increases the number of white corpuscles in the blood, scrofula cannot be regarded as sustaining any causative relation to that great and constant increase of white corpuscles which constitutes the disease leucæmia; for this disease, as remarked by Niemeyer, does not occur in childhood, when the scrofula is active, but in manhood, when the scrofulous diathesis has become latent.

The anatomical change which a lymphatic gland, when it becomes the seat of scrofulous disease, undergoes, consists in an exaggerated production of the lymphatic cells, while an increase in the amount of stroma is quite subordinate, or none at all. The hyperplasia sometimes occurs gradually, and without the signs characteristic of inflammation; in other cases it presents all the features of a true inflammatory process. Caseous degeneration is the more apt to occur, the larger the number of newly-formed cells, and the greater their mutual pressure.

The hyperplasia is sometimes primary, a direct result of the diathesis. In other instances it is secondary to some adjacent inflammation, the morbid process being propagated along the lymphatic vessels. Thus, while primary hyperplasia of the cervical glands is not infrequent in children who have a decided scrofulous diathesis, secondary hyperplasia of these glands is more frequent. It results from eczema of the scalp, or face, or otitis, or any of the various forms of stomatitis. And so pharyngitis often gives rise to hyperplasia of the tonsils, which are lymphatic glands. The scrofulous nature of the glandular enlargement is apparent from the fact that it continues long after the primary inflammation which gave rise to it has abated; for lymphatic glands sometimes become tumefied in those who are not scrofulous, either from direct injury or propagated inflammation; but the tumefaction is commonly less in degree, and in most instances it soon abates when the exciting cause is removed.

The glands which most frequently undergo scrofulous enlargement are the cervical, inguinal, bronchial, and mesenteric, but in those who are highly scrofulous, the glands in the vicinity of any protracted inflammation are very prone to hyperplasia, and sometimes become cheesy. Thus, I have seen enlarged and cheesy glands in the vicinity of bone which was affected by scrofulous ostitis, or periostitis.

Glands enlarged by scrofula frequently remain indolent for many months or years, undergoing no appreciable alteration, but they are liable to attacks of acute inflammation, when they enlarge, become tender, and the surrounding connective tissue infiltrated and hard. Suppuration is the common result, and the abscess, if subcutaneous, escapes through the skin, leaving a cicatrix which is permanent.

More frequently, with proper therapeutic and hygienic measures, the glandular hyperplasia gradually abates after a longer or shorter period, probably by fatty degeneration, liquefaction, and absorption of the redundant cells. Even when suppuration occurs in certain of the glands, others, and the majority, return to their normal state in this gradual way. Calcification of a gland has been known to occur, but it is rare.

In order to complete the description of the anatomical characters of scrofula, it would be necessary to describe the various inflammations to which the diathesis gives rise. It will suffice, however, in this connection, simply to enumerate them. Those which are most common and of chief importance, occur in the skin, mucous membrane, connective tissue, the bones with their periosteal covering, the joints, and the two important organs of special sense, the eye and ear.

SYMPTOMS.—The scrofulous diathesis is exhibited by certain physical signs, which are present in infancy, but are more manifest in childhood. In one class of strumous children, they are as follows: Form, tall and slender, quickness of movement and perception; intelligence, good; skin, thin and semi-transparent, through which the superficial veins are distinctly seen; features, delicate; cheeks, habitually pale or florid, and flushed by slight excitement; eyes, bright, with bluish conjunctiva; muscles and bones, slender in proportion to their length. Those children who present these peculiarities are said to have the erythitic form of the diathesis.

Others have what has been designated the torpid scrofulous habit, which is characterized by softness and flabbiness of the flesh, distended abdomen, large head, broad face, slow, languid movements, and an over-production of fat in the subcutaneous connective tissue in certain situations, especially the nose and upper lip. Though typical cases can be readily referred to one or the other of these forms, there are many cases which are intermediate.

One of the earliest of the scrofulous manifestations is a subcutaneous cellulitis giving rise to abscesses, commonly not large, with little surrounding induration, little pain, tenderness, and heat, and slow in discharging; in a word, indolent. The most frequent seat of these abscesses is upon the extremities, but they may occur upon the scalp or elsewhere. They gradually heal when the pus escapes, their site being indicated for a considerable time by the depression and reddish discoloration of the skin, which gradually returns to its normal state. Ordinarily, these abscesses do no harm apart from the reduction of the general health which they effect, but when occurring in localities where the connective tissue lies upon the periosteum, as upon the fingers, periostitis may result, with destruction of the surface of the bone. Again, thrombi may occur in the veins of the inflamed part, giving rise to emboli, embolismal pneumonia, and death. Specimens from such a case were presented by me to the New York Pathological Society in 1868.

The scrofulous affections of the skin often also occur at an early age, even before dentition. They are more frequent in infancy than in childhood. The most common are eczema and impetigo, and of rarer occurrence, ecthyma and lupus. But all of these may occur in those who are not strumous or who do not present the characteristics of the strumous diathesis.

Scrofulous affections of the mucous surfaces are scarcely less frequent than those of the skin. They present the ordinary features of mucous inflammations of a subacute and chronic character.

Sometimes they occur without obvious exciting cause; in other cases there is an exciting cause, as exposure to cold; but the inflammation once established, continues on account of the diathetic condition. It is sometimes a matter of doubt whether a mucous inflammation is of such a character that it is proper to designate it scrofulous, especially if it occur upon such surfaces as are often the seat of ordinary inflammation. If the child has heretofore presented symptoms of scrofula, if the inflammation is subacute, and there is no apparent cause to originate or sustain it apart from the diathesis, it is probably of a strumous character. The diagnosis is rendered more certain by observing the effect of anti-strumous remedies. The most frequent of these inflammations are coryza, tracheo-bronchitis, and conjunctivitis, the last being a part of the more general inflammation of the eye. More rarely, stomatitis, pharyngitis, vaginitis, and, according to some, entero-colitis, are of a strumous character. Coryza gives rise to snuffling respiration, the formation of crusts around and within the nares, and excoriation of the upper lip. The tracheo-bronchitis is attended by thickening of the mucous membrane, increased production of mucous and epithelial cells, and a loud tracheal râle, accompanying each inspiration.

Strumous inflammation of the mucous membrane of the trachea and bronchial tubes is not a very infrequent disease in this city. It sometimes originates in a simple inflammation from cold, or the tracheo-bronchitis of measles, or pertussis, but it is apt to continue, with its râles, cough, and scanty expectoration, for months, unless relieved by a proper course of treatment.

Among the most common of the strumous affections, are inflammation of the eyelid, designated psorophthalmia, and that of the eye itself. The former is characterized by redness and thickening of the lids, detachment of the eyelashes, and inflammation and altered secretion of the "Meibomian glands;" the latter, namely, strumous ophthalmia, by pain, lachrymation, photophobia, and a moderate degree of hyperæmia of the affected organ.

Inflammations of the external and middle ear have their origin very generally in the strumous diathesis. Occasionally there is an exciting cause of the otitis, as an injury, or severe constitutional disease like scarlet fever. Protracted otitis, whether external or internal, and especially that form of it which leads to ulceration, destruction of the ossicles, and caries of the petrous portion of the temporal bone, it is proper, in a large proportion of cases, to regard and treat as strumous.

Inflammations of the skeleton, whether of the periosteum, bones themselves, or the joints, are common in childhood. They sometimes occur without apparent exciting cause, but most frequently result from injuries of a trivial character. Some of the best observers and highest authorities, as regards the surgical diseases of children, both in this country and Europe, state that they do not consider these affections to be of a strumous nature; while others regard them as manifestations of struma. After carefully examining the reasons for this variance in opinion, I am convinced that the difference of views in reference to this matter occurs from a different understanding of the nature of scrofula. Those who state that the affections alluded to are not scrofulous, believe, so far as I have been able to ascertain, that scrofula and the tubercular diathesis are identical. As tubercles are not, as a rule, present in children who suffer from these affections, it is therefore held that these affections are not scrofulous. If those holding this belief were told, or could be made to believe, that scrofula is entirely distinct from the tubercular diathesis, that it is merely a name applied to a diathetic condition in which the tissues are easily wounded, there would probably be but one opinion as regards the scrofulous nature of these inflammations. For, as I have often had an opportunity to observe, they occur in a large proportion of cases from very trivial injuries, showing a highly vulnerable state of the tissues.

Holmes, in his useful and eminently practical *Treatise on the Surgical Diseases of Children*, says of one of the most common of the affections alluded to, namely, morbus coxarius: "The affection in question occurs very frequently in strumous children, a circumstance which has led to its being denominated strumous. * * * If by strumous be meant a state of the system which renders the subject of it prone to the deposit of tubercle in the viscera, I think that there is good reason for asserting that morbus coxarius often attacks children who are not strumous, *i. e.*, who display no such tendency to the deposit of tubercle." Still, Mr. Holmes states "that there is that condition of the system which disposes its subjects to the development of low inflammations of various kinds," which is almost the full definition of scrofula, as understood by us.

The stubbornness and frequent disastrous consequence of scrofulous inflammation of the skeleton is well known. Nearly every bone, as well as its periosteum, is liable to this form of inflammation, but some are more frequently affected than others. Inflammation of the bone may terminate by resolution, by the formation of an abscess, or, and frequently, by carious or necrotic destruction of the bone itself. Necrosis is most apt to occur in the shafts of the long bones, caries in the spongy extremities of these bones, and in the spongy portions of the short bones. If abscesses form, the pus may finally escape from the system by a tedious ulcerative process, or, retained, may undergo cheesy degeneration. Scrofulous arthritis, if early detected and properly treated, may resolve, leaving no ill effect; otherwise, there is apt to be suppuration, ulceration, cartilaginous and osseous, and anchylosis.

Scrofulous children are perhaps no more liable to inflammation of the internal organs than other children, but the inflammatory products are more liable to cheesy degeneration, and the prognosis is therefore less favorable. The most frequent of these inflammations, and the one of chief interest, is pneumonia. Catarrhal pneumonia, so frequent in early life, whether primary or secondary, in connection with measles, pertussis, etc., is a disease often involving grave consequences in those who are decidedly scrofulous; since, instead of resolving, the affected lung-tissue presents strong tendency to caseous degeneration, ending in consumption of the lungs and death. I have most frequently noticed cheesy pneumonia during extensive epidemics of measles, as a complication or sequel of this disease. It may occur in those who are not scrofulous, if the vital powers are greatly reduced, but it is so much more common in the scrofulous, that some recent writers have designated this form of inflammation by the term scrofulous, instead of cheesy, pneumonia. From the fact, however, of its sometimes occurring in the non-scrofulous, the term cheesy or caseous, especially, too, as it expresses the anatomical state, seems more appropriate.

RELATION OF SCROFULA TO TUBERCULOSIS.—It is now almost universally admitted that rachitis is entirely distinct in its nature from scrofula, although, till a recent period, some of the best writers upon diseases of children, as Barrier, held that it was one of the manifestations of the scrofulous diathesis. Although the peculiar anatomical changes in rachitis occur chiefly in the osseous system, which is so often the seat of scrofulous disease, yet the character of these changes is so different from those which are admitted to be of a scrofulous nature, and especially as a large proportion of the rachitic do not present evidences of a strumous diathesis, struma and rachitis are justly regarded as distinct diseases, and their coexistence in the same individual as a coincidence.

Pathologists and writers on diseases of children are not agreed as to the relation of scrofula to tuberculosis. Some, as M. Bouchut, hold that the scrofulous and tuberculous diatheses are identical, believing tubercles a late manifestation of scrofula, while others, among whom occur the illustrious names of Jenner, Virchow, and Villemin, deny their identity, though admitting their close relationship. Let us consider the facts, some of which are of recent discovery, which show in what manner, or to what extent, scrofula and tuberculosis are related.

1st. In scrofula the lymphatic glands are more frequently affected than any other part, a true hyperplasia of their cellular elements occurring. This hyperplasia occurs to a greater or less extent in the majority of marked cases, and, when persistent, is the most reliable sign of the diathesis. The cells, which are produced so abundantly in scrofulous glands, are, to all appearance, identical in character with the cells of which tubercles are composed. In other words, the physiological type of the tubercle cell is the normal cell of the lymphatic gland, and the proliferation of this cell, as we have already stated, produces the enlarged gland of scrofula. But it is to be observed, as showing the difference between scrofula and tuberculosis, that this cell is never found in the affections admitted to be scrofulous, in any other situation than in these glands, where they exist normally; whereas, in tuberculosis, they are produced abundantly, not only in the lymphatic glands, but in various organs and tissues throughout the system, which contain no such cell in their normal state. Moreover, the origin of this cell in the lymphatic gland is, according to Virchow, different in scrofula and tuberculosis. While in the former it is produced by segmentation of the lymphatic cells, in the latter it is produced from the cells or nuclei existing in the connective tissue of the gland, as it is in other situations.

2d. It has already been stated that the products of scrofulous inflammation are very liable to cheesy degeneration. In children, indeed, cheesy degeneration more frequently results from the scrofulous affections than from any or all other diseases. Take, in connection with this fact, the very important recent discovery that tubercles are caused, in a large proportion of cases, by particles of cheesy matter, detached from the main mass, and conveyed to the lungs or other organs, and we see another intimate relation between scrofula and tuberculosis.

3d. While the above facts show the close relationship of scrofula and tuberculosis, other facts relating to their hereditary transmission show, in my opinion, their non-identity. The children of syphilitic parents are very apt to acquire thereby a scrofulous diathesis, and be affected by scrofulous ailments, while they cannot, as a rule, be said to possess the tubercular diathesis, or exhibit any more tendency to tubercles than other children who are in a state of equal cachexia. This does not comport with the doctrine that scrofula and tuberculosis are identical. Again, the infant of the parent who has advanced tuberculosis exhibits a great liability to tubercles, and less in degree to scrofulous ailments. If the diathesis of scrofula and tuberculosis were identical, we would expect that a larger proportion of these infants would exhibit scrofulous manifestations, and a smaller proportionate number become tubercular, since scrofulous affections are so much more frequent than tubercles.

4th. As favoring the view that there are two diatheses, writers have stated the fact, that the greatest liability to tubercles is at an age when scrofulous affections are rare, namely, from the age of twenty to thirty years. M. Bouchut attempts to reconcile this fact with his theory of one diathesis, by analogical reasoning, which does not seem to me to be sound. He holds that there are distinct groups of manifestations of the diathesis, according to the age or the time of its continuance, as in syphilis, and that tubercles are the last manifestation. But tubercles may occur at any age, even in infants of a few months. Indeed, they are more common at the age of two or three years than at ten or twelve. The reasoning of M. Bouchut does not, therefore, appear to invalidate the argument, for how can we consider tuberculosis an advanced stage of scrofula, when it *may* occur at any age or at any period of those affected with scrofula?

5th. Recent investigations demonstrate that tuberculosis is less a diathesis than was formerly supposed, or than scrofula is admitted to be. That there is, and was previously, a tubercular diathesis in a majority who are affected with tubercles, cannot be denied; but, on the other hand, there are those, and not a few, who become affected with tubercles from the operation of local causes solely, when there was no diathetic predisposition to them. Thus, an individual who has never presented any evidences of scrofula or tuberculosis, but whose system is perhaps in a reduced state from some cause, takes a pneumonia, and the inflammatory products, instead of undergoing absorption, become cheesy, and from this cheesy substance tubercles result in the manner already described. Local causes have developed a tuberculosis unaided by a diathesis. Such cases are not very unusual. Contrast with this the fact that in the causation of scrofulous ailments the scrofulous diathesis always plays a conspicuous part.

6th. The following fact may be inferred from the foregoing, but it is so important in this connection, as showing the difference between scrofula and tuberculosis, that it is proper to consider it under a separate heading. Scrofula simply modifies the ordinary physiological or pathological processes, while in tuberculosis there occurs, in the tissue affected, a pathological process which is peculiar. Thus in tuberculosis there is produced from the connective tissue, or more rarely from epithelial cells, a cell which under no other circumstances is produced in these parts; whereas if scrofula affects the same tissues, there is simply an increase in the normal histological elements or inflammation, with inflammatory products.

PROGNOSIS.—As scrofula may be acquired through anti-hygienic influences, so it may disappear or become latent through influences of an opposite character. Therefore the manifestations of scrofula may be limited to a brief period, or they may occur at intervals through the whole of childhood and the first years of youth. When the diathesis is inherited, and fostered by unfavorable circumstances, the scrofulous affections appear earliest, are the most varied and severe, and continue longest.

In most cases, with proper treatment, the prognosis is good, provided there are no serious local ailments. Scrofulous manifestations gradually disappear, the diathesis ceases or becomes latent, and the health is fully re-established. Though the general health is restored, certain scrofulous inflammations, continuing for a certain time, and reaching a certain grade of intensity, produce permanent deformity or impairment of function. In unfavorable cases, death may occur from exhaustion due to protracted suppurative inflammation, or from tuberculosis resulting from the cheesy product of a scrofulous inflammation. Again, if the function of a vital organ is permanently impaired by scrofulous disease, the prognosis of any subsequent inflammatory affection of that organ is rendered much less favorable.

TREATMENT. *Prophylactic.*—Measures designed to prevent scrofula are impossible without the co-operation of willing and intelligent parents. It is obvious that the prevention of congenital scrofula requires the treatment of disease or impaired health in the parent. If parents should be taught or should remember that good health in themselves is the necessary condition of the inheritance of a sound constitution in the child, and should adopt such therapeutic and regimenal measures as would procure this, the number of cases of inherited scrofula would be materially reduced.

As the first years of life are very important, both for correcting the diathesis when inherited, and for preventing its development in those of sound constitution, care should be taken that the regimen of the child be such as would in no way produce deterioration of the general health. The nursing infant, if the mother is in poor health, should be provided with a healthy wet-nurse, for in young children the diathesis may be acquired solely by the use of food that is scanty or of poor quality. Those old enough to be weaned should have plain and nutritious diet, with a proper admixture of animal food. More or less out-door exercise, and a residence in a salubrious locality with sufficient air and sunlight, are requisite.

Curative.—As scrofula originates in a state of weakness existing in the parent in the congenital, and in the child in the acquired, form of the disease, and is characterized by feeble resistance of the tissues to irritating agents, the inference is reasonable that all tonics have, to a certain extent, an anti-scrofulous effect upon the system. The ordinary vegetable tonics, and sometimes the ferruginous, are indeed useful in the treatment of scrofula. Employed in connection with proper regimenal measures, they are sufficient, in many cases, to remove the diathesis after a time, or render it latent. Besides these medicinal agents, which tend to correct the scrofulous diathesis by their general tonic effect, there are certain others which experience has shown to be beneficial in the treatment of scrofulous affections, and which are, therefore, largely used. One of these is cod-liver oil, which contains iodine with numerous other ingredients.

Cod-liver oil is useless or nearly so in the torpid form of the diathesis, which is characterized by an increased deposit of fat in the subcutaneous connective tissue, slow circulation, and sluggish muscular movements. On the other hand, in the treatment of the erythitic form it possesses real value. Its protracted use in such cases does so modify the molecular condition of the tissues that they are less liable to inflammation, and the diathesis is, therefore, rendered milder or removed. From one to three teaspoonfuls, according to the age, should be given three times daily. While we frequently experience so much difficulty in administering it to adults affected with tuberculosis, and sometimes find it necessary to discontinue its use on account of its nauseating effect, scrofulous children rarely refuse to take it, and it does not seem to diminish their appetite.

Iodine is justly celebrated as a remedy in the treatment of scrofulous affections, but it is a question whether it has not been overrated as a remedy for the diathesis itself. Iodine employed internally is especially serviceable in glandular hyperplasia, and in scrofulous thickening and induration of the connective tissue and periosteum. In general, it should not be administered to children in its isolated state, on account of its irritating properties, but one of its compounds should be employed. The compounds which are chiefly prescribed in the treatment of scrofula are the iodides of starch, iron, potassium, and sodium. If, as is frequently the case, the patient is pallid, and his appetite poor, the iodide of iron should be preferred; if not in this cachectic state, the iodide of starch. Pharmaceutists prepare syrups of both these iodides, so that they can be readily administered to the youngest child. The iodide of starch may be administered by dropping from one to five drops of the officinal tincture of iodine on a little powdered starch, and giving it in syrup. These iodides are preferable to the iodides of potassium and sodium for internal administration to children, as they are not irritating to the mucous membrane, and the iodine is readily set free. Prof. Dalton has, indeed, demonstrated that the iodide of starch is decomposed in most of the liquids of the body, and the iodine liberated.

In this city a large proportion of the scrofulous children are cachectic, and need iron, and the iodide of iron is more frequently employed than any other iodine compounds. In the Out-door Department at Bellevue it is daily prescribed for the scrofulous children, and with the best results. It is taken readily, and for a lengthened period without producing gastric symptoms. To a child of six months we give at this institution one drop three times daily, and to one of two years three drops, with or without cod-liver oil.

The internal use of mercury as an antidote for scrofula is now generally discarded. Unless, perhaps, in those cases in which the diathesis is immediately dependent on syphilis, its use for this purpose, from what we know of its therapeutic effects, would probably be more injurious than beneficial. Walnut leaves, employed in various ways, either as a decoction, infusion, wine, or extract, have been highly extolled for the treatment of scrofula, but their use has not met with favor in the profession, and comparatively few can speak from their own observations of their effect.

Among the medicines which have been from time to time employed for the cure of scrofula, some of which have had considerable reputation, but which have nearly fallen into disuse, may be mentioned sarsaparilla, elecampane, conium, digitalis, horseradish, and certain compounds of silver, gold, arsenic, baryta, and bromine. From what we know of the nature of scrofula, it is probable that none of these has any effect upon the diathesis or upon scrofulous ailments, except such as improve the appetite and general health, like horseradish. The same hygienic measures are required in the treatment of scrofula as are demanded in the prophylaxis of it.

The scrofulous affections require additional and special treatment. It would transcend the proposed limits of this paper to speak of the various measures, medicinal, mechanical, etc., which are demanded for their cure. I shall only describe the treatment of the affection, which is especially characteristic of scrofula, namely, glandular hyperplasia.

It is the common practice to treat these glands, if they are subcutaneous, by daily application over them of the officinal tincture, the compound tincture, or the compound ointment of iodine. It is my opinion, from observing the effects of these agents, that they are too irritating for ordinary cases. Applied daily, they cause proliferation of the cells of the epidermis, so that in two or three days the thickening of the cuticle is greatly increased, and its external layer begins to exfoliate. It has appeared to me that what we observe in the epidermis illustrates, to a certain extent, what occurs in the gland underneath, as a result of active counter-irritation. The gland does not resolve, its superfluous cells are not destroyed and absorbed, as was desired, but the treatment tends rather to increase the proliferation of the cells of the gland, or the formation in it of true leucocytes. We have seen that a local cutaneous inflammation, as eczema or impetigo, is apt to cause the neighboring lymphatic glands to enlarge. How, therefore, can we expect to reduce a glandular swelling by a mode of treatment which establishes a similar condition. I once produced, partly by accident, such an amount of vesication over an enlarged, hard, and apparently somewhat indolent gland, in an infant of fourteen months, that for a week I was very anxious lest a sore would result, which would heal with difficulty, or leave a permanent cicatrix, and yet, instead of dispersion of the glandular swelling, the pathological processes were so promoted that suppuration and discharge of pus occurred by the time that the cuticle had re-formed. If hyperplasia of the lymphatic glands could be cured by counter-irritation, it should have been in this case.

The correct mode of treating these glands, therefore, as regards external measures, I hold to be, to apply the iodine preparations in such a manner that the largest amount of iodine will reach the glands by absorption, with little irritation of the skin. I am not prepared to state what is the best formula for the application of this agent. During the last few months, we have been attempting to determine this in the children's class at the Out-door Department at Bellevue, but our statistics of cases are not at present sufficiently complete or numerous to enable me to make a positive statement. I feel justified, however, from the observations already made, in recommending the following formulæ, as preferable to the officinal preparations which are commonly employed:—

1st. ℞. Potas. iodidi ʒj;
Ung. stramonii ℥j. Misce.

To be rubbed over the gland several times daily. It should not be applied as a plaster, as it is too irritating and will vesicate. I have known a glandular swelling, which had continued about three months, to disappear in as many weeks, under its use in connection with internal remedies. Glycerine may be employed in place of stramonium ointment. It makes a nicer preparation.

2d. ℞. Liq. iodinii compositi,
Glycerinæ, equal parts.

To be applied three times daily with thorough friction, but less frequently if the skin becomes irritated. In place of Lugol's solution, tincture of iodine may be employed, with perhaps a little larger proportion of glycerine. One of the chief advantages from the employment of glycerine with the stronger iodine preparations is that it prevents to a great extent the shrivelling and desiccating effect on the cuticle, rendering it soft and in a favorable state for absorption.

3d. ℞. Liquoris iodinii compositi ℥ss;
Aquæ ℥xv. Misce.

To be kept constantly upon the skin over the gland by lint soaked with it, over which oil-silk may be applied to prevent evaporation.

4th. In the *Medical Press and Circular* of August 3d, 1870, J. Waring Curran states that he has used with great success what he designates a new iodine paint, consisting of half an ounce of iodine, the same quantity of iodide of ammonium, 20 ounces of rectified spirits, and 4 ounces of glycerine. I have never employed it, but presume from its composition that it is useful. If too irritating, it can, of course, be diluted.

Mercurial ointments have been recommended by writers of reputation for the treatment of these glands. I have employed them, and known them to be employed, but cannot say that I have ever observed any benefit from their use whatever. In the children's class at the Out-door Department at Bellevue we have discarded them entirely for this purpose, although both the citrine and white precipitate ointments, diluted with an equal quantity of lard, have been used with great apparent benefit for chronic coryza of a strumous nature, and also occasionally for external otitis of the same nature.

In a paper read at the meeting of the British Medical Association in 1870, by Mr. Jordan, the writer recommends, as attended with success, vesication, not over the gland, but at a little distance from it, as, for example, behind the neck, for treatment of the cervical glands. But a mode of treatment which seems so unlikely to be beneficial requires stronger proof of its utility than has yet been presented.

When the gland becomes actively inflamed, as indicated by increased heat and tenderness, and redness of the skin, applications of iodine are no longer proper. They increase the local disease. There is no longer any probability of resolution of the glands, and poultices should be applied.

CHAPTER III.

TUBERCULOSIS.

TUBERCULOSIS occurs at any period of life. It is, indeed, more frequent in early manhood than previously; but it presents peculiar features in children, and especially in infants. Like most other general diseases, tuberculosis has a local manifestation which serves for diagnosis. This is a small, round, nearly transparent granulation, designated tubercle, which is developed within a tissue, or upon its surface. In certain situations it departs [illegible] rounded form, and is more or less flattened. [illegible] and, when fully developed, varies in size f[illegible] small pea. It has recently, in its various [illegible] great interest by pathologists in Europe, and to a certain extent in this country, and these investigations have already thrown considerable additional light on the nature of tuberculosis.

The statistics of tuberculosis, previously to the last ten years, were not strictly accurate, since cheesy degeneration, of whatever part, was regarded by most pathologists as always a tubercular lesion, and its presence in the cadaver was therefore considered sufficient proof that the disease of which the patient died was tuberculosis, whereas it is now known to be, in many instances, a degenerated product of simple inflammation. I have records of the histories and post-mortem examinations of thirty-six cases of tuberculosis occurring under the age of five years, having rejected all cases of cheesy degeneration when not accompanied by other evidence of tuberculosis. Thus caries of the vertebræ, with cheesy substance in the bony excavations, I have not considered tubercular. I have rejected one case in which three large cheesy bronchial glands lay in front of the carious vertebræ, inasmuch as there were no tubercles in the lungs or elsewhere. In another rejected case, the only lesions were empyema of the left pleural cavity, hyperplasia, and cheesy degeneration of the bronchial glands, and a single large cheesy nodule in the right lung.

ETIOLOGY.—The tubercular diathesis may be inherited. Hence the well-known fact of tubercular families. Cases are not infrequent in which hereditary tuberculosis proves fatal before the death of the affected parent. The offspring of a tubercular parent does not, as a rule, have tubercles at birth; but the tubercular diathesis, at first latent as in syphilis, manifests itself in a few weeks or months in the formation of tubercles, and in the consequent cough and emaciation. In two cases, however, in my collection, a cough was observed, according to the statement of friends, as early as the second or third week. Under good hygienic conditions, the inherited diathesis may remain latent or be removed. If both parents are tubercular, the offspring almost necessarily becomes so.

Tuberculosis frequently results from prolonged anti-hygienic conditions in those previously healthy and of healthy parentage. It may result from residence in damp, dark, and dirty apartments, from scanty or unwholesome food, protracted and exhausting diseases, in fine, from any agency which gives rise to great and continued impoverishment of the blood. Age is a predisposing cause. Tuberculosis is comparatively rare under the age of one year, while it is not uncommon in wasted infants between the ages of two and five years. This remark is fully substantiated by the statistics of the Nursery and Child's Hospital and Infant's Hospital of this city.

Is tuberculosis propagated by infection? Most physicians would answer in the negative, though in some countries, as in Italy, it is stated that the profession have long regarded it as mildly infectious. Every physician of experience must have remarked the frequency with which tuberculosis occurs in those not predisposed to the disease, but who have been in intimate relation with consumptive patients. This has been commonly regarded as due in no way to infection, but has been thought to be a coincidence, or has been attributed to an influence not fully understood, which the emotions or imagination exerts in the causation of diseases. But recent discoveries concerning the etiology of tuberculosis, which will presently be related, afford ground for the opinion which some of our best authorities in the pathology of tuberculosis, as Waldenburg, now hold, that minute particles exhaled or expectorated from the lungs may be the medium of infection.

In December, 1865, M. Villemin read before the Academy of Medicine of Paris and published his celebrated memoir, which contained the results of his experiments in inoculating certain lower animals with tubercular matter. Since then the fact has been established by many experiments, that tubercle may be produced in the rabbit and other animals by inserting under their skin various pathological products, whether tubercular or non-tubercular, as gray tubercles, cheesy products, thickened pus, etc., and by inserting finely divided foreign substances, not animal, as aniline blue, and also by traumatic irritations which give rise to the formation of inflammatory products under the skin, as the use of a seton. The coloring matter, whether introduced alone or in combination with a pathological substance, is found in the tubercle which results in the lungs or elsewhere. Therefore it is inferred that tubercle in these experimental cases is produced by minute particles of the inserted substance, which enter the circulation and are deposited in the lungs or other organs. Where they are deposited, inflammation (formative irritation) occurs, with proliferation of the cellular elements of the part. This corpusculation produces the tubercle.

The importance of these discoveries is apparent. Cheesy substances produced in the system, whether in the lungs, lymphatic glands, bones—as in vertebral caries—or elsewhere, and also long-retained purulent collections, as in empyema, may give rise to tuberculosis, provided particles of the morbid substance gain admittance into the circulation.

Blood extravasated in the alveoli of the lungs, and undergoing degenerative changes, is considered a cause of tuberculosis; but such extravasations are rare prior to the age of puberty. Protracted inflammation of the air-passages, as bronchitis or laryngitis, is stated to give rise to tubercles in certain cases, but it is not easy to see how this could occur except when the inflammation has extended to the lungs or given rise to cheesy degeneration of the contiguous glands. In infancy and childhood the common cause is a diathesis inherited, or acquired through impoverishment of the blood by previous disease or anti-hygienic conditions, or it is infection of the system from cheesy glands or purulent collections.

Post-mortem examinations in connection with these recent discoveries demonstrate that the immediate cause of the formation of tubercles in the lungs, spleen, and other viscera, in certain cases, is hyperplasia and cheesy degeneration of the bronchial and mesenteric glands, whether or not this glandular affection is to be considered tubercular. Thus in the last two cases which I have examined there were minute transparent tubercles in the lungs, some becoming yellow, evidently of very recent formation, and also in one of the cases in the spleen, while in both cases the bronchial glands were enlarged and cheesy, and in one also the mesenteric. In another case, occurring in the Child's Hospital, the bronchial and mesenteric glands were cheesy, with all the thoracic and abdominal viscera healthy, while there were granulations nearly the size of a pin's head, due to cell proliferation, as ascertained by the microscope (tubercular), in the pia mater at the base of the brain, along its sides, and between the hemispheres.

Cases are less frequent, but are occasionally met, in which retained purulent collections appear to be the cause of the formation of tubercles. Thus, in 1870, I presented to the New York Pathological Society the lungs, containing minute, recent tubercles, removed from an infant, who had died when a few months old. The lungs were otherwise healthy, and there were no cheesy glands, for which a careful examination was instituted; but in the left thigh was a large deep-seated abscess, which had been detected a month before death.

Another, and probably the most frequent local cause of tuberculosis, is cheesy pneumonia. Caseous degeneration of the inflammatory products is common in young and feeble infants affected with pulmonary inflammation, and the supposition is reasonable that particles are more readily detached from a caseous mass in the lungs than in most other situations. Certainly, in this city, cases are not infrequent of young children presenting the history of pneumonia, cheesy degeneration, and finally tubercles, especially during epidemics of measles.

GENERAL ANATOMICAL CHARACTERS OF TUBERCULOSIS.—Analysis of the blood of tubercular patients shows an increase in the water, albumen, fats, and white corpuscles, and a decrease in the number of red corpuscles. The fibrin is slightly diminished, except in cases complicated by inflammation, in which it may be in excess. The chief interest, however, as regards the anatomical characters of tuberculosis, pertains to the tubercle. The tubercle is as characteristic of tuberculosis as the eruption is of an exanthematic fever. It is produced, as already stated, by a local proliferation or corpusculation. It is, therefore, a cell-growth, and not a deposit.

If we examine with a microscope a thin section of a recent tubercle, we will observe in its peripheral portion, in which proliferation was active at the time of death, large mother cells, spindle-shaped fibro-plastic cells, and small round cells, which have been released from the mother cells. This zone of proliferation often has considerable extent. Passing towards the central portion of the tubercle, we find these small round cells in great abundance. They represent a more advanced stage of the tubercle, since the central part is oldest. They are the most numerous cells in the tubercle, and they have been designated the tubercle cells. They resemble closely in appearance the smaller of the white corpuscles of the blood, and cannot be distinguished from the normal cells of the lymphatic glands, each consisting of a single large nucleus surrounded by protoplasm. They are among the most fragile of pathological cells. The cells are held together by a transparent adhesive substance, which is firm and resisting.

Every tubercle tends to undergo a molecular change by which its transparence is lost. This consists in a decay of the cells and the intercellular substance. Granules of fat are deposited within them, and the cells shrivel and disintegrate. Fragments of cells, and shrunken cells, and cell-nuclei, are thus produced, which Lebert described as the tubercle cells, and which were accepted as such by all observers till Virchow ascertained their true character. The molecular change which I have described commences in the interior of the tubercle, and extends outward till the whole tubercle becomes opaque and yellow, and at the same time so friable as to be readily crushed between the fingers. The yellow tubercle is therefore only an advanced stage of the gray semi-transparent.

It is evident that tubercle in its first period possesses vitality, and, like all neoplasms, has its bloodvessels. These are soon closed by coagula or granular fibrin, mixed with white blood corpuscles. When the tubercle has reached the yellow transformation, its vessels are no longer pervious, but it is surrounded by a vascular zone, in which circulation continues. The subsequent history of tubercle is well known. It is seldom, perhaps never, absorbed. It softens, and henceforth, as has been said by a German pathologist, its history is that of an abscess. It is an irritant, producing inflammation in the surrounding tissues, with thickening and induration, and abundant production of pus cells, which mingle with the tubercle elements. Ulceration and discharge of the liquefied substance upon one of the free surfaces is the common result. In exceptional cases, instead of softening, the tubercle may undergo fibroid degeneration or cretification.

Anatomical Characters in Infancy and Childhood.—The anatomical characters of tuberculosis in the first years of life vary in certain particulars from the form which they present in the adult, but after the age of three years the differences are fewer and less pronounced than previously.

Tubercular laryngitis, so common in the adult, is absent in a large proportion of cases under the age of three years, and when present has little intensity; and ulceration of the larynx very seldom occurs. This has been attributed to the fact that there is so little expectoration in young children, the sputum being an irritant. Niemeyer, however, does not consider the sputum of tuberculosis sufficiently irritating to cause laryngitis and laryngeal ulceration; but the arguments in favor of this mode of causation, in my opinion, more than counterbalance those which have been presented against it.

I have never met a case of tubercular ulceration of the larynx or trachea in the post-mortem examination of young children, nor do I recollect ever treating a case in which there was that degree of dysphonia which indicated ulceration. Rilliet and Barthez, in more than 300 necropsies of tubercular cases, found no ulcers in the larynx or trachea under the age of three years; 8 cases between the ages of three and ten years, and 8 between ten and fourteen years. The ulcers, whether seated in the larynx or in the trachea—and they are in most cases in the former, since the inequalities upon the surface of the larynx favor the retention of the sputum—are commonly small, superficial, round or elongated, and with little thickening or inflammation of their borders. Occurring in the folds of the mucous membrane, for example, around the vocal cords, their form is usually elongated.

Bronchitis is not infrequent. This inflammation is due to, and dependent on, the pulmonary tubercles, and is therefore most intense in the part of the lung where the tubercles are most abundant and furthest advanced. Consequently it is more intense on one side than on the other, and it may be unilateral. It differs in this respect from idiopathic bronchitis, which is commonly pretty uniform on the two sides. It differs also in the fact that it is sometimes accompanied by ulcerations. The ulcers are round or elongated in the direction of the axis of the tubes, and, like those of the larynx or trachea, are superficial. Idiopathic bronchitis of infancy and childhood does not cause ulceration. Circumscribed inflammation may attack a bronchial tube, as, indeed, the trachea, and gives rise to ulceration and perforation, from the presence and pressure of a diseased lymphatic gland external to the tube. This subject will be treated of hereafter.

LUNGS.—It is well known that in the adult tubercles are always present in the lungs, if they occur in any part of the system. I have met two cases in which the lungs were free from tubercles in 36 post-mortem examinations of children who died of tuberculosis. One of the two was an infant, but its exact age is not stated in the records. It had cheesy degeneration of thymus and bronchial glands, enlargement of mesenteric glands, but without cheesy degeneration, and disseminated tubercles in liver and spleen. The other, fifteen months old at death, had tubercular meningitis, with numerous granulations upon the convexity of the brain, and the other usual lesions of meningeal inflammation, with bronchial and mesenteric glands slightly enlarged and cheesy, and one of the former softened. In one case, then, in 18, the lungs had escaped the disease. Rilliet and Barthez state that they found the lungs non-tubercular in 47 cases in 312, and Hillier did in 25 cases in 160. In their cases, therefore, the lungs were exempt from tubercles in about 1 case in 7. But it is to be recollected that the statistics of these observers were prepared at the time when all cheesy degenerations were thought to be tubercular, and the bronchial and mesenteric glands are sometimes cheesy when there are no tubercles or lesions referable to tuberculosis in any other part of the system. I have records of two such cases, which I reject from my statistics of tuberculosis, as there is no evidence that the disease was anything else than simple inflammation. Did I include these cases, my statistics would correspond with theirs.

Pulmonary tubercles in children under the age of three years are, as a rule, discrete, and disseminated through the lungs. In cases at this age, which have advanced to a fatal termination, we commonly find yellow tubercles from the size of a pin's head to a shot in the different lobes, many still semi-transparent if the disease has been of short duration, but if protracted most of them yellow, and here and there one softened and surrounded by condensed fibrous tissue. Around the semi-transparent or gray tubercles, many of which were growing, and therefore were in the state of active cell proliferation at the time of death, narrow vascular zones can often be detected by the naked eye.

Under the age of three years, tuberculosis exhibits but little tendency, perhaps none, to affect the upper lobes sooner or in greater degree than the lower.

The following are the statistics relating to the site of the tubercles in the lungs in the cases which I have examined. All, it is to be remembered, were under the age of three years:—

	Cases.
Tubercles disseminated throughout the lungs	26
Tubercles disseminated throughout the two upper lobes	3
Tubercles disseminated through right middle lobe and left lower lobe only	1
Tubercles disseminated through left upper lobe only	2
Tubercles disseminated (few and semi-transparent) in left lung only	1
Tubercles disseminated in three points in right, and two in left lung	1
No tubercles in lungs	2
	36

Between the ages of three and fifteen years, statistics show that the upper lobes are more liable to tubercles than the lower; but the difference in liability is not great. In many cases occurring in this period, the different lobes are affected nearly simultaneously, and not very infrequently the upper lobe is the last which is involved. In October, 1866, I made the post-mortem examination of a boy who died in the Children's Service of Charity Hospital, at the age of fifteen years, and small scattered tubercles were found in the lower lobe of the left lung, while all other portions of these organs were healthy. Rilliet and Barthez, who include in the same statistics all cases from birth to the age of fifteen years, found gray semi-transparent tubercles

	Cases.
In the right superior lobe in	63
In the right middle lobe in	43
In the right lower lobe in	55
In the left superior lobe in	65
In the left inferior lobe in	54

The same observers found yellow tubercles in the

Right superior lobe in	40
Right middle lobe in	28
Right inferior lobe in	39
Left superior lobe in	35
Left inferior lobe in	31

It has already been stated that tubercle originates in a circumscribed inflammation. On the other hand, tubercle, especially when softening commences, is itself an irritant, exciting inflammation around it. Inflammation occurring from this cause is obviously likely to be protracted, continuing for weeks or months, unless the tubercular matter is eliminated by ulceration. The highly vascular and delicate lungs of the young child are very liable to inflammation when they are the seat of tubercles, and as the tubercles are disseminated, the pneumonia is commonly more extensive than when it occurs from ordinary causes. In fifteen, or nearly one-half of the cases, there was pneumonia affecting portions of one or more lobes, or an entire lobe. From the extent and position of the solidified portions, it was obvious that in most cases the inflammation originated from the irritating effect of the tubercular matter, while in others it was due to hypostatic congestion, occurring in consequence of the long-continued recumbent position and the feebleness of circulation. In these fifteen cases the seat and extent of the inflammation were as follows:—

	Cases.
Nearly entire right lung	2
Nearly entire middle and lower lobe	1
Entire left upper lobe	2
A considerable part of both lungs	1
Posterior parts of both lower lobes	4
Posterior part of left lung	1
Left lower lobe, and right middle and lower lobes	1
Left upper lobe (contained a large cavity) and posterior part of left lower lobe	1
Nodules of inflamed lung around tubercles	2

The inflammation in about one-third of the cases was due to hypostasis, as it occurred in depending portions, extended but little into the lungs, and sustained no relation to the amount of tubercle. It was in the stage of red, or more rarely of gray, hepatization.

In seven of the cases there were pulmonary cavities as large in proportion as we ordinarily find in tuberculosis of the adult. The seat of one was in the right lower lobe; of two, the left upper lobe; of one, the right upper lobe; of another, the right lung, its exact seat not stated; and in the remaining case the cavity, which was the largest of all, occupied the interior of all three lobes on the right side. Some idea of the size of these cavities may be learned by the following extracts from the records. 1st Case.—"A small superficial cavity communicating on one side with a bronchial tube, and on the other side with a small circumscribed collection of pus in the pleural cavity." 2d Case.—"Cavity of the size of a hickory-nut." 3d Case.—"Cavity of the size of a large hickory-nut." 4th Case.—"Cavity three-fourths of an inch in diameter." 5th Case.—"A large abscess." 6th Case.—"The cavity occupied nearly the whole of the interior of the left upper lobe." 7th Case.—"About half the right lung excavated into a cavity which extended through the three lobes."

Circumscribed pleuritis, produced by tubercles underneath the pleura, was observed in seven cases. It was ordinarily attended by little exudation except the fibrin, but in one case a sufficient amount of serum had been exuded to compress considerably the lung. Pus was not observed in any notable quantity.

Emphysema was present in several cases, chiefly in the upper lobes, sometimes vesicular, with fulness or bulging of the lung, an anæmic appearance of it, and doughy, inelastic feel. In other cases emphysema was interstitial, producing little bladders of air under the pleura, especially towards the root of the lung, or separating the lobules by wedge-shaped or irregular interspaces filled with air. In one case air had escaped from an emphysematous bladder into the right pleural cavity, causing pneumothorax and collapse of the lung.

Next to the lungs, the bronchial glands are more frequently diseased than any other organs, in the tuberculosis of infancy and childhood. They undergo the successive structural changes which characterize glandular inflammations, namely, hyperplasia, and more or fewer of them cheesy degeneration and softening. In the state of hyperplasia the firmness is diminished, and they have a pale flesh-color. Cheesy degeneration commences in one or more points in the gland, sometimes in the peripheral, sometimes in the central portion, and it extends till the whole gland presents the well-known cheesy appearance. When the gland softens, the thick liquid presents a puriform appearance, consisting of amorphous matter, fatty particles, and the shrivelled and disintegrated cells of the gland. Soon pus cells occur, and their number increases.

Microscopy shows no anatomical difference between the hyperplasia or cheesy degeneration of the lymphatic glands occurring from inflammation, and that from tubercle; but since the bronchial and mesenteric glands are not often cheesy or greatly hyperplastic from simple inflammation, and are commonly not only greatly enlarged but cheesy in the tuberculosis of young children, we conclude that the inflammation which gives rise to this hyperplasia and degeneration in such cases is of a tubercular character.

Rilliet and Barthez state that the bronchial glands were tubercular in 249 cases in children, while the lungs were tubercular in 265 cases. All cheesy glands, it is to be recollected, they considered tubercular. In 4 of the 36 cases which I have examined, no record was preserved of the state of the bronchial glands; in one case there was no perceptible hyperplasia and no cheesy degeneration; in two there was hyperplasia, but no cheesy degeneration, while in the remaining twenty-nine cases there was cheesy degeneration of more or fewer of the enlarged glands, or parts of them, with occasional softening. In the fact that the bronchial glands are tubercular and enlarged, we have an explanation in part of the fact, that the symptoms in the tuberculosis of young children differ from those in the adult, since Louis found the bronchial glands tubercular in only twenty-eight per cent. of the adult cases of tuberculosis which he examined, and Lombard in only nine per cent. A gland pressing upon the recurrent laryngeal or pneumogastric nerve, or the trachea, may give rise to dyspnœa and a cough; or on the descending vena cava or one of the venæ innominatæ, to congestion of the brain and meninges, intra-cranial serous effusion, and even thrombosis in the cranial sinuses. The fact that a softened bronchial gland not infrequently is eliminated from the system, by ulceration, into a bronchial tube or the trachea, is well known. In one case which I observed the ulceration had destroyed portions of three of the cartilaginous rings of a bronchus, and the aperture was plugged by a cheesy fragment of a softened gland which protruded. Occasionally, it is stated by authors, the ulceration is into one of the large vessels of the mediastinum, or even into the œsophagus.

In no case did I find tubercles in the heart or pericardium, though they have been observed in rare instances in the latter. The mesenteric glands were enlarged by hyperplasia, and more or less cheesy, in 30 cases; in their normal state, to appearance, in two cases, and in the remaining four cases their condition was not stated. In most of the cases the mesenteric glands were smaller and less cheesy than the bronchial, but in a few instances they were larger than the bronchial and more cheesy.

It is a noteworthy fact, as bearing on the causative relation of these glands to tubercles, that not infrequently the amount of hyperplasia and cheesy degeneration of the former was very considerable, while the tubercles in the lungs or elsewhere were small, even minute, semi-transparent, and evidently of recent formation.

ABDOMINAL VISCERA.—In children, tubercles in the solid organs of the abdomen rarely give rise to appreciable symptoms, as they are small and disseminated, not impairing materially the function of the part in which they are located. On the other hand, peritoneal and intestinal tubercles, and the enlarged and cheesy mesenteric glands, give rise to symptoms which require description. The most frequent seat of peritoneal tubercles is upon the attached surface of the peritoneum, where they are formed from the connective tissue. They are distinctly seen through the peritoneum, and cause some prominence of it. Exceptionally their seat is upon its free surface. Every portion of the peritoneum, whether visceral, parietal, or omental, is liable to tubercles, but general tuberculization of so extensive a surface does not occur in any one case. The tubercles are spherical or lenticular, and most of them small. Sometimes they are very numerous, but so minute as to be scarcely visible. They are gray or yellow, according to the age. Peritoneal tubercles often produce circumscribed peritonitis, causing adhesion of opposite surfaces. The tubercles in themselves cannot be detected by palpation; but masses or *plaques* composed of tubercles and inflammatory products are sometimes so large that they can be felt through the abdominal walls.

The symptoms of peritoneal tuberculosis are attributable, for the most part, to the peritonitis. Among them may be enumerated abdominal tenderness or pain, meteorism, ascites—usually slight—and derangement of the bowels, commonly diarrhœa. As tubercles in this situation occur, in most cases, subsequently to tubercles elsewhere, the symptoms which have been described are associated with and are subordinate to others.

Stomach and Intestines.—The most common seat of gastro-intestinal tubercles is the small intestine, and more frequently its lower portion, near the ileo-cœcal valve, than its upper or central. They are rare in the duodenum or contiguous part of the jejunum. They are developed ordinarily in the connective tissue, either that lying under the mucous or the serous surface.

Gastro-intestinal tubercles are often accompanied by ulceration of the adjacent mucous membrane. But in a certain proportion of cases there is probably no causative relation of the tubercles to the ulcers, for ulceration of this membrane is not infrequent in the tuberculosis of children, when there are no tubercles in the walls of the stomach or intestines. The following statistics of Rilliet and Barthez, relating to this point, will aid in an understanding of the symptoms:—

Tubercles in walls of stomach, 7 cases, { with ulcers, 6 cases.
{ without " 1 case.
Ulcers of gastric mucous membrane, without gastric tubercles, 14 cases.
Tubercles in small intestines, 82 cases, { with ulcers, 70 cases.
{ without " 12 "
Ulcers without tubercles in small intestines, 51 cases.
Tubercles in large intestine, 15 cases, { with ulcers, 10 cases.
{ without " 5 "
Ulcers in large intestine, without tubercles, 47 cases.

The ulcers have vascular, thickened, and infiltrated borders. Their diameters vary from a line to half an inch or more, and their general form is circular, or, if two or more unite, irregular. Tubercular ulcers of the stomach are mostly in the great curvature, those of the small intestines in the ileum and lower part of the jejunum, and those of the large intestine in the cœcum.

The following table exhibits the state of the principal abdominal viscera in the 36 cases:—

	Liver.	Spleen.	Kidneys.
Tubercular	12	22	1
Non-tubercular	16	6	21
Not stated	8	8	14
Fatty	5	0	0

In no instance did I observe tubercular softening in the abdominal organs, and a large proportion of the tubercles in the liver, spleen, and kidneys were still in the first stage. In the five cases in which the liver was recorded fatty, this state of the organ was obvious to the sight, as it is in tuberculosis of the adult. A moderate excess of fat in the hepatic cells may have been present in some of the other cases, but it was not sufficient to be appreciable without the microscope. It is to be remarked that in the five cases in which the liver was recorded fatty, this organ contained no tubercles. The spleen is seen to have been the most frequent seat of tubercles of all the viscera, except the lungs. In fourteen cases the intestines were examined; and in five, tubercles discovered developed in the connective tissue. The intestinal tubercles were small, and ulceration had occurred of the mucous membrane which covered them.

The brain was examined in fifteen cases. In twelve cases the amount of cerebro-spinal fluid varied from ℥ss to v, by estimation. In two others the records state that there was a considerable amount of this fluid, the exact quantity not being given, while in the remaining case congestion of the brain and meninges was noticed, but nothing was recorded in regard to the amount of cerebrospinal liquid. The increase of the cerebro-spinal fluid in tuberculosis is attributable to wasting of the brain, a *hydrocephalus ex vacuo*, and in some cases to passive congestion and serous transudation, due to feeble circulation, or obstructed flow from the pressure of bronchial glands on the vessels within the thorax, as already stated.

Tubercles were present in the pia mater in three cases: in two with fibrinous exudation; in the other without fibrin or other evidence of inflammation.

SYMPTOMS.—The symptoms in tuberculosis of children arise in part from the diathesis, and in part from the tubercles. Before the period of tubercles, there are signs of failing health, such as loss of appetite, flabbiness of the soft parts, or emaciation, lassitude, and loss of strength. These symptoms continue after the formation of tubercles, and increase.

The features are ordinarily pallid, but during the paroxysms of fever, to which tubercular patients are subject, they may be flushed. Lividity of the features, due to imperfect decarbonization of the blood, occurs, if there are enlarged bronchial glands which compress the vessels within the thorax, or if there is extensive pulmonary tuberculization, or pulmonary tuberculization, whether extensive or not, which is complicated by capillary bronchitis or pneumonia.

The skin is nearly natural, or it loses its flexibility and softness, and becomes dry and rough. In some patients there is, at times, general or partial furfuraceous desquamation of the skin, due to exaggerated development of the epidermis. Children, like adults, notwithstanding the general dryness of the surface, are liable to perspirations at night and in sleep. This symptom is less frequent at the commencement than at an advanced period, and in acute than in chronic cases, in the very young, namely, those under three or four months, than in older children. It is more abundant about the head and limbs than elsewhere, and is sometimes confined to these parts.

Anasarca is not infrequent. It sometimes arises from obstructed circulation, in consequence of compression of the thoracic vessels by enlarged lymphatic glands; in other cases it is due to diminished plasticity of the blood, a result of the tubercular cachexia. The latter is the more common cause. It is not an important symptom, on account of the small amount of serous transudation, and the character of the parts in which it occurs.

Emaciation, already alluded to, is early, constant, and progressive. Under the age of six or eight months it is less marked than in older children, many preserving considerable rotundity of features and form even in advanced tuberculosis. The failure of the strength corresponds in amount and progress with the emaciation. Slight at first, and exhibited only by a degree of lassitude, it gradually increases, till for weeks before death the little patient is fatigued by the ordinary muscular movements, and is disposed to keep quiet.

The nervous system is not ordinarily affected except in cases of intra-cranial tubercles. In acute tuberculosis, or tuberculosis complicated by severe inflammation, there may be agitation and delirium, especially at night.

In most patients the mucous membrane of the buccal cavity presents its normal appearance, with the exception of a moist fur upon the tongue, and a paler hue than normal of its surface generally. In acute tuberculosis, and in cases complicated by inflammation, the tongue is sometimes dry and brown. The appetite may be normal till the close of life, or it is poor or changeable. Occasionally it is increased, although the disease is progressing. The bowels are regular or relaxed. Diarrhœa may be a prominent symptom, even when there are no intestinal tubercles or ulceration. Meteorism and fulness of the abdomen are common.

Fever, constant, but usually with evening exacerbations, is rarely absent. It continues for weeks or months. During the exacerbation the pulse rises to 120, 140, or even to 180 beats per minute, and there is a corresponding exaltation of the temperature, which in the latter part of the day, without inflammatory complication, ranges from 100° to 102° or 103°. The fever is a symptom of diagnostic value as regards the nature of the disease, though it does not indicate the seat of the tubercles.

In addition to the symptoms now described, there are *special* symptoms, due to tuberculization of the different organs. In young children, on account of the fact already referred to, namely, the tendency to a generalization of tubercles, there is apt to be a blending of the symptoms which arise from different organs, but with care it is not difficult in most instances to isolate and refer them to their proper source. The following are the symptoms which arise from tuberculization of the more important organs. 1st. ENCEPHALON. The symptoms produced by tubercles of the encephalon vary according to their seat and size, and the structural changes in surrounding parts to which they give rise. Meningeal tubercles, which are located for the most part in the meshes of the pia mater, and by preference along the course of the small arteries, are ordinarily small, not more than a line in diameter, and they may remain latent for a considerable time. In the majority of cases, however, they sooner or later cause meningitis, the symptoms of which are well known and need not be described. But tubercles in this situation do sometimes give rise to symptoms when there is no meningeal inflammation. They occasion congestion of the surrounding vessels, and serous transudation, and if developed on the under surface of the pia mater they may produce symptoms by encroaching upon and irritating the brain; for they are sometimes so much imbedded in the convolutions that careful examination is required in order to determine that they are meningeal, and not cerebral. Among these symptoms may be mentioned headache, frontal or occipital, sometimes intermittent, nausea, melancholy, and in certain cases the symptoms produced by the serous transudation.

The symptoms of *cerebral* are in part similar to those of meningeal tubercles, but in most cases others of a neuropathic character are present, which serve for differential diagnosis. The differences as regards the symptoms of different patients affected with cerebral tubercles are attributable in part to the fact that their size and rapidity of growth vary, but more to the difference in their seat; for any part of the brain may be the seat of tubercles, though certain portions, as the cerebellum, are more frequently affected than others.

The child with cerebral tubercles is quiet, but irritable and easily excited. Delirium is not common, but many before the close of life exhibit a degree of mental dulness. The headache, common in cases of cerebral as well as meningeal tubercles, may be nearly general, or it is frontal, parietal, or occipital, according to the seat of the tubercles. It is often lancinating, often intermittent.

Clonic convulsions occur towards the close of life. Exceptionally they are among the earliest symptoms. Observations have failed to establish any relation between the seat of the tubercles and the localization of the convulsions. The convulsions may be unilateral, while the tubercles are in both hemispheres; or general, while the tubercles are on one side only.

The severity and duration of the convulsive attacks, and the frequency of their occurrence in tuberculosis of the brain, vary greatly in different patients. They have been attributed to softening of the cerebral substance, which sometimes occurs immediately around the tubercles, to local congestions excited by them, and also to serous effusion in the ventricles. The convulsions, sooner or later, end in paralysis or coma.

Contraction, or tonic convulsion of certain muscles, is sometimes observed. Its most frequent seat is the muscles of the back, and of one or both of the lower extremities. It is a late symptom. It occurs in those cases in which there is softening around the tubercles, and usually in the muscles of the opposite side.

Paralysis is also a late, but not an unfrequent symptom. It is preceded by headache, and sometimes, as already stated, by convulsions. Occurring as a symptom of tuberculosis of the brain, it is due either to pressure on a cranial nerve, or to compression and perhaps softening of the cerebral substance. The paralysis may be paraplegic, commencing as feebleness of the lower extremities, and increasing until it becomes complete, or a more or less complete hemiplegia. In paraplegia due to tubercles of the brain, the cerebellum is, as a rule, their seat, while paralysis of one side, or of certain muscles of one side, indicates tubercles of the opposite cerebral hemisphere; but there are exceptions. Paralysis of the third cranial nerve gives rise to ptosis, of the sixth to paralysis of the external motor nerves of the eye, and therefore to internal strabismus.

Feebleness or loss of vision, inequality, oscillation, and finally dilatation of the pupils, are not infrequent symptoms of tuberculosis of the brain, and they possess great diagnostic value. Atrophy of the optic nerve, causing amaurosis, sometimes results from tubercles as well as other tumors of the brain. Atrophy of this nerve occurs not only when the tubercles are so located as to press on the optic tract, in which case the explanation is apparent, but also, in certain patients, when the tubercles are in other parts of the brain. In these last cases it is thought by Brown-Séquard and others that the imperfect nutrition of the nerve is due to contraction of its nutrient vessels, produced by the tubercles through reflex action.

In tuberculosis of the brain, symptoms pertaining to the respiratory, circulatory, and digestive systems are either absent or are quite subordinate to those of a neuropathic character. Slowness of the pulse, with or without intermittence, has sometimes been observed, and it is therefore a symptom of some diagnostic value. Towards the close of life both pulse and respiration are apt to be accelerated. Vomiting, constipation, and retraction of the abdomen, which are so common in meningitis, are only occasional symptoms.

BRONCHIAL GLANDS.—During the progress of tuberculosis, hyperplasia, cheesy degeneration, and softening may occur of various lymphatic glands throughout the body, but the bronchial and mesenteric are not only those which are most frequently affected, but they are the only glands, unless in exceptional instances, which materially increase the danger or give rise to special symptoms. These symptoms either have a mechanical cause, namely, the pressure exerted by the enlarged glands on contiguous parts, or they are due to softening of the glands and consecutive inflammation and ulceration.

The following are the principal symptoms due to compression. Some of them are not infrequent; others are rare. Compression of the pulmonary veins retards the flow of blood from the lungs to the left auricle, giving rise to congestion, and, in extreme cases, œdema of the lungs, with sanguineous extravasations into the lung substance, congestion of the right cavities of the heart, hepatic veins, and of the systemic capillaries generally. Compression of the pneumogastric nerve, or of the recurrent laryngeal, which is the motor nerve of the laryngeal muscles, produces a cough which is apt to be spasmodic, and modifies the voice. The cough resembles that of pertussis, and has been mistaken for it, but it is not so violent or protracted. The voice, clear and natural at first, becomes by degrees hoarse or feeble from deficient innervation of the laryngeal muscles.

An enlarged gland, or mass of glands, lying against the trachea or one of the bronchial tubes (this may occur with tubes up to the third or fourth division), and pressing its walls inward, obviously obstructs more or less the current of air. If there is considerable obstruction, a loud sonorous râle is produced, which is heard distinctly at a distance from the chest, obscuring other râles. It is loudest when the patient is agitated, and it sometimes intermits. Feeble respiratory murmur, dyspnœa, and a cough are not infrequent in bronchial phthisis. Diminished intensity of the respiratory murmur is general or partial, according to the seat of the compression. It has been most frequently observed at the summit of the lungs. In certain patients this symptom is not constant, the respiration being for a time feeble and then normal. The dyspnœa may be a prominent and distressing symptom, the alæ nasi dilating, and the infra-mammary region sinking with each inspiration. The cough which occurs when a gland presses on the trachea or bronchial tube, is due to the tracheitis or bronchitis to which the pressure gives rise. If ulceration occur at the point of pressure, the cough continues as long as the ulcer remains. Compression of the large veins within the thorax, which return blood from the head and upper extremities, causes more or less congestion of these parts, with, perhaps, transudation of serum in the subcutaneous cellular tissue, and within the cranium. Rarely a softened gland by ulceration gives rise to other symptoms than those mentioned, namely, hemorrhage by ulceration into a vessel, or pleuritis or pneumonitis if the ulceration is towards the lungs.

Improvement in the condition of the patient affected with bronchial phthisis is not unusual. It may be permanent, but in most patients it is temporary, so that in a few weeks or months the symptoms are as severe as before. The improvement is due to softening and elimination of a gland which had given rise to symptoms by its mechanical effect, or by the inflammation which it had excited.

Physical Signs.—These are absent or obscure in the incipient disease, when the glands are small, and they are most marked in those cases in which the glands are so large as to press on the thoracic walls, since the glands then become the medium for the transmission of sounds to the ear. The part of the thorax against which they most frequently press is the dorsal vertebræ, from the first to the sixth, and each side of the vertebræ, and less frequently the upper third of the sternum. The physical signs are dulness on percussion over the interscapular space, and perhaps, though to a less extent, over the upper part of the sternum, and bronchial respiration in the same situations. Occasionally a bruit can be detected, due to the pressure of a gland on one of the large vessels of the chest.

Lungs.—A cough is one of the earliest and most persistent of the symptoms of pulmonary tuberculosis. It is so rarely absent, that those of largest experience do not meet with more than one or two such cases. It varies in severity and frequency. If the tuberculosis is acute and its course rapid, the cough, even from its commencement, is frequent, so as to weary the patient and deprive him of needed rest. But in ordinary cases, namely, when the disease is chronic, the cough commences gradually, attracting little attention by its infrequency, but becoming more frequent and painful as the disease advances.

Ordinarily the cough is dry in the first weeks or months, but it becomes looser in the course of the disease, from the greater amount of bronchial inflammation. In exceptional instances the cough has a spasmodic character, like that produced by pressure of an enlarged bronchial gland on the pneumogastric or recurrent laryngeal nerve. This occurs from the accumulation of viscid mucus in one or more of the bronchial tubes, usually in dilated portions of them, from which it is with difficulty expectorated.

The respiration in pulmonary tuberculosis is accelerated in proportion to the degree of tuberculization. Tuberculization of a considerable part of both lungs gives rise to dyspnœa, especially when, as is ordinarily the case, bronchial, pulmonary, or pleuritic inflammation has supervened. Pneumonitis or pleuritis gives rise to the expiratory moan, and as these inflammations, when induced by tubercles, are protracted, this symptom may continue for weeks or months.

Patients under the age of six years do not expectorate, or but rarely. After this age expectoration is not common in the commencement of pulmonary tuberculosis, but in the confirmed disease it is a pretty constant attendant of the cough. Hæmoptysis is also rare under the age of six years, and less frequent subsequently than in the adult. It is most apt to occur in those cases in which there is already passive congestion of the lungs, produced by the pressure of enlarged bronchial glands in the manner already described. Patients old enough to make known the subjective symptoms, sometimes complain of fugitive pains under the sternum or between the shoulders.

PHYSICAL SIGNS.—In young children the physical signs of incipient pulmonary tuberculosis are wanting, or are so obscure as not to be readily recognized. This is due to the small size and dissemination of the tubercles. In older children, because, as a rule, the tubercles are aggregated, and are more frequently at the apices of the lungs than elsewhere, as in the adult, the physical signs appear early, and are readily recognized. In the advanced disease, whether in infancy or childhood, when inflammation and more or less destruction of the lung substance have occurred, the physical signs, so far from being obscure, enable us in most cases, in connection with the history, to make an immediate and positive diagnosis.

In most children affected with pulmonary tuberculosis the irregular and imperfect expansion of the lungs produces by degrees changes in the shape of the thorax, which are apparent on inspection. In some, the lungs being habitually imperfectly inflated, the obliquity of the ribs is increased, and the thorax consequently elongated, while its antero-posterior and transverse diameters are diminished. This obviously increases the convexity or arch of the diaphragm, so that this muscle sometimes lies against the thoracic walls as high as the ninth or even eighth rib. If the costal cartilages are yielding, there is anterior flattening of the chest and depression of the sternum; if they are firm, on account of the more advanced age, the chest remains circular.

Another shape of the thorax is not infrequent in feeble tubercular children, especially infants, who have suffered from repeated attacks of bronchitis. It occurs also in the non-tubercular, if the conditions which favor it are present. The conditions are, on the one hand, feebleness of the patient, with diminished force of respiration and impaired resiliency of the ribs; and, on the other, obstruction by mucus of one or more of the bronchial tubes. Occlusion, more or less complete, of a bronchial tube, and consequent obstruction to the current of air, produces a corresponding degree of collapse in the portion of lung to which the tube leads. The portions which collapse are, in most cases, the lower lobes, and the thin anterior margins of the upper lobes. This causes lateral depression of the lower ribs, except such as are pressed outward by the abdominal viscera, and an anterior projection of the lower part of the sternum. The shape of the thorax in these cases differs from that in rachitis, in the fact that the lateral depression does not extend to the upper ribs, nor does the upper part of the sternum project.

Certain precautions should be observed in examining the chest by percussion and auscultation. The child should sit or recline, with the arms and shoulders in the same position, and the axis of the trunk straight. Inclination of the trunk to either side, raising or depressing a shoulder, may produce an appreciable difference in the two sides as regards the physical signs. Percussion of the two sides should be practised at the same stage of respiration. A slight difference in the degree of resonance does not afford proof of disease, unless it is observed at different examinations; for in feeble children it often happens that all portions of the lungs do not expand alike, so that where we have noticed slight dulness at one visit, it may by the next have disappeared, or even at the same visit if forcible inspirations are excited.

The physical signs ascertained by palpation, auscultation, and percussion are, as in the adult, vocal fremitus, bronchial respiration, bronchophony, and dulness on percussion. In those cases in which the tubercles are mainly at the apices of the lungs, diminished expansion of the infra-clavicular region is observed during inspiration, and this part of the thoracic wall is permanently depressed, so that the clavicles are unusually prominent. If there is emphysema, this flattening does not occur, or is slight. Dulness on percussion, though more frequently observed in the infra-clavicular region than elsewhere, may be present in different isolated places. If pneumonia supervene, the dulness not infrequently extends over a considerable part of one lung. The crack-pot sound is often observed on percussion, but it possesses no diagnostic value. It can be produced, when there is no pulmonary disease, by percussing over a bronchus.

Bronchial respiration and bronchophony are important signs, as indicating solidification of the lung, but they do not show whether the solidification is tubercular or pneumonic, or the two conjoined. This must be determined by the history of the case, the extent of surface over which these signs are heard, and their persistence. When the tubercles begin to soften, and the lung tissue breaks up, moist râles appear, often hoarse and gurgling, obscuring the bronchial respiration. A cavity in the lung, or pneumothorax, is attended by the same physical signs as in the adult.

PLEURA.—Little need be said in reference to the symptoms and physical signs of tuberculosis of the pleura, since this affection is in most instances associated with tuberculosis of the lungs, and is not distinguishable from it. But now and then the pleural tubercles are numerous and large, giving rise to symptoms, while those of the lungs are small, few, and without symptoms, or attended by symptoms which are quite subordinate. Either the costal or visceral portion of the pleura may be the seat of tubercles. They are developed directly under the pleura, or upon its free surface. They are very apt to occur in the newly-formed connective tissue which results from pleuritis. Those located upon the free surface, or under the costal pleura, rarely soften, while those under the visceral pleura sometimes soften and cause ulceration. Occasionally numerous aggregated tubercles form a firm continuous layer upon the surface of the pleura, preventing, if upon the visceral pleura, full expansion of the lung. This may give rise to a degree of dulness on percussion, and feebleness of the respiratory murmur. Ordinarily, however, in this form of tuberculosis, the symptoms and physical signs, so far as any are observed, are due to the pleuritic inflammation which the tubercles excite.

STOMACH AND INTESTINES.—The symptoms in tuberculosis of the stomach and intestines vary according to the seat and stage of the tubercles.

Tubercles, whether gastric or intestinal, are not at first accompanied by symptoms, or the symptoms are obscure and ill-defined. Symptoms arise when inflammation occurs in the adjacent tissues. Diarrhœa is one of the most common and persistent of the symptoms. The alvine discharges are brown and thin, and sometimes in advanced cases very offensive. They may be streaked with blood which has escaped from the ulcers. Intestinal tubercles, developed immediately underneath the peritoneal coat, sometimes cause local peritonitis, usually of little extent. This gives rise to circumscribed pain, tenderness, and more or less meteorism.

DIAGNOSIS.—It is evident from the foregoing description of symptoms that the diagnosis of incipient tuberculosis is much more difficult in children than adults. Before commencing the examination, it is advisable to learn the hereditary tendencies of the family and the history of the patient, especially as regards antecedent diseases or debilitating agencies, and the duration of the symptoms.

Tuberculosis of the encephalon is diagnosticated with more difficulty than that of the thoracic or abdominal organs; but certain of these organs are in most cases tubercular at the same time, and the knowledge of the fact that they are affected aids in the diagnosis of the disease of the brain or its meninges. Among the symptoms which possess diagnostic value may be mentioned cephalalgia and more or less fever, with exacerbations in the commencement of the disease, and at a more advanced period strabismus, inequality or irregular action of the pupils, impairment of vision, retraction of the head, and convulsive movements or paralysis.

In certain cases careful observation and discrimination of symptoms are requisite, in order to determine whether they arise from intra-cranial tubercles, or from congestion of the brain caused by obstruction in the venous circulation by the pressure of enlarged bronchial glands.

The diagnosis of bronchial phthisis, when the glands are still small, is necessarily uncertain, on account of the absence of symptoms. When they have increased in size and are so located as to press on the pneumogastric or recurrent laryngeal nerve, producing the spasmodic cough already described, the differential diagnosis between that disease and pertussis may be made by attention to the following facts: Bronchial phthisis occurs singly, and is non-contagious, while pertussis occurs as an epidemic, and with evidences of contagion. There are no successive stages, namely, those of catarrh, paroxysmal cough, and decline, as in that disease, and the cough, though paroxysmal, is short, and without hoop or vomiting.

In feeble children, with inherited tubercular diathesis, emaciation, sweats, and a chronic cough, with the absence of pulmonary symptoms, should excite suspicions that the bronchial glands are involved. The evidence is almost conclusive if the cough becomes paroxysmal, and there is a loud, persistent, tracheal, or bronchial râle.

In certain of the patients affected with this form of the disease, we have seen that the prominent symptoms are due to compression of one or more of the large vessels in the chest. Compression of these vessels, and consequent retarded circulation, may be confidently referred to enlarged bronchial glands, since aneurism, carcinomatous or other tumors, which would produce a similar result, are very rare before puberty. Sometimes the diagnosis is rendered certain by the physical signs observed by auscultation, and percussion over the sternum and the interscapular space. The condition of the external glands should also be observed, as those of the axilla, neck, and groin.

The diagnosis of pulmonary, though more readily made than that of intra-cranial and bronchial tuberculosis, is often difficult and uncertain. This is, in part, explained by the fact that the tubercles are so frequently disseminated, while emaciation and a chronic cough are not infrequent from other causes than tubercles. Rachitis, intestinal worms, dentition, simple tracheal or bronchial inflammation, may be attended both by a chronic cough and emaciation. Caution is therefore requisite in order to avoid a grave error in diagnosis. Precipitancy in the diagnosis of doubtful cases is worse than indecision, and it is often best to postpone an expression of opinion as to the nature of the disease till the case has been observed for a few days.

The significance and importance of the symptoms, physical signs, and other facts on which a diagnosis must be based, have already been sufficiently pointed out. It is difficult, in fact in certain cases impossible, to discriminate between simple cheesy pneumonia and cheesy pneumonia which has ended in the formation of tubercles. The patient has an attack of catarrhal pneumonia; but, instead of absorption of the inflammatory product, cheesy infiltration occurs, and the lung in places becomes infiltrated with pus, softens, and breaks down. The patient presents the symptoms and physical signs of phthisis. He may recover after a protracted sickness, or may die. The disease may, and often does, remain a pneumonia; but this is a condition of the lungs which favors the development of tubercles, and in a certain proportion of cases tubercles do form in the last weeks of life. Though the differential diagnosis in such cases between simple pneumonia and tuberculosis supervening on pneumonia is impossible, practically the discrimination is unimportant, as the same treatment is required.

Advanced pulmonary tuberculosis, except when it supervenes upon pneumonia, can in most instances be readily diagnosticated by a careful examination. Still, it is to be recollected, as already pointed out, that certain of the symptoms and physical signs, which occurring in the adult would afford almost positive proof of pulmonary tuberculosis, in children not infrequently have a different origin.

The diagnosis of tubercles in the abdominal organs is facilitated by the presence of symptoms which indicate at the same time tuberculosis of the lungs. Among the chief diagnostic signs of tuberculosis of the peritoneum may be mentioned meteorism and a degree of tenderness on pressure. But there is danger of mistaking the tympanitic state of the intestines common in ill-nourished infants and the rachitic, or the fulness due to enlarged spleen or liver, to that occasioned by peritoneal tuberculization, and *vice versâ*. The history of the case, and a careful examination of accompanying symptoms, and the shape and feel of the abdomen, usually suffice to establish the diagnosis. In simple gaseous distension of the abdomen there is an absence of the symptoms, general and local, which attend tuberculosis; rachitis occurs at an earlier age than peritoneal tuberculosis, and digital examination, aided by percussion, enables us to diagnosticate enlargement of the liver or spleen.

Tubercular enlargement of the mesenteric glands cannot be positively diagnosticated when they are small. When they have attained such a size that they can be felt through the abdominal walls, palpation in connection with the history and symptoms of tuberculosis suffices to establish the diagnosis. The glandular tumors can be diagnosticated from other tumors by the fact that they are tender on pressure, and occupy the umbilical region, while fecal tumors are not tender, and are located in the iliac or lumbar region. Gastro-intestinal tuberculosis cannot be positively diagnosticated. Protracted diarrhœa, or frequent attacks of diarrhœa, not readily controlled by medicine, and occurring in tubercular cases, are probably associated with intestinal ulceration; but in only a certain proportion of cases of ulceration are there also tubercles in the walls of the intestines.

PROGNOSIS.—Death is the ordinary result of tuberculosis in the child, as it is in the adult; but now and then one recovers. Hospital statistics show that the average duration of the disease is from three to seven months. Under favorable circumstances it is more protracted, even to two or three years. Those succumb soonest who inherit a strongly-marked tubercular diathesis, live in damp, dark, and ill-ventilated apartments, and whose diet is scanty or of poor quality. Therefore in the poor quarters of the city tuberculosis presents a worse form and pursues a more rapid course than among families in better circumstances.

Favorable prognostic signs are absence of tubercular diathesis, good appetite and general health, with little emaciation, infrequency of cough, with respiration, pulse, and temperature nearly normal. Such symptoms may afford hope of recovery with judicious regimenal and therapeutic measures. On the other hand, if the symptoms are grave, death is inevitable, unless in bronchial phthisis, in which, even when there is considerable urgency of symptoms, the offending gland is sometimes eliminated by softening and ulceration, and the patient improves temporarily, if he does not ultimately recover. Complete and permanent recovery is, however, quite exceptional.

Death in tuberculosis of children may occur from exhaustion induced by the general disease, or from the local effect of the tubercles. Thus, in intra-cranial tuberculosis it may result from coma; in pulmonary tuberculosis, from dyspnœa, though more frequently from exhaustion; in that of the bronchial glands, from coma, dyspnœa, exhaustion, or even from hemorrhage; in that of the abdominal organs, from peritonitis or protracted diarrhœa.

TREATMENT. *Prophylactic.*—Though tuberculosis is so obstinate and fatal, it is often in our power, if forewarned, to avert it. A nursing infant, whose mother has the disease, should be immediately taken from the breast and intrusted to a wet-nurse. The health of the mother as well as infant requires this. If the father has the disease, and the mother's milk is inadequate or of poor quality, and the infant is under the age of six months, the same change should be made, rather than supply the deficiency by artificial feeding. Children who are weaned should have plain but nutritious and easily digested diet, a part of which should be milk. If the predisposition to tuberculosis is strong, a little alcoholic stimulant may be allowed three or four times daily in the milk, though with the risk of creating an appetite for it. To an infant two or three drops of Bourbon whisky may be given for each month of its age, and to children of three to five years a teaspoonful. Residence in an airy and salubrious locality, out-door exercise, a scrupulous avoidance of exposure by which a cold might be contracted, are necessary in order to the continued latency of the diathesis. Loss of flesh or appetite, or other evidences of failing health, indicate the need of additional measures of a therapeutic character. Iron, with cod-liver oil, citrate of iron and quinine, elixir of calisaya bark, or other tonic, should be employed in connection with the alcoholic stimulant and suitable regimen. By the employment of such precautionary measures as soon as indicated, multitudes of children might be saved from this disease who now perish.

Curative.—The treatment of the general disease should be the same in children as in adults. The medicinal curative agents which are required in ordinary cases are cod-liver oil, iron, or other tonic, and an alcoholic stimulant given three or four times daily. The oil is less unpleasant and more readily taken when combined with the stimulant. An eligible mixture is equal parts of cod-liver oil and wine of iron, or cod-liver oil with half its quantity of Bourbon whisky, and a few drops of the tincture of chloride of iron. It should be given after nursing or the meals. At the age of one year two drops of the tincture of iron and a teaspoonful of cod-liver oil would constitute an ordinary dose.

If the cod-liver oil is not tolerated, or if it impairs the appetite, it should be discontinued. In cases of diarrhœa it is of little or no benefit, and may do harm. Under such circumstances patients sometimes do better with simple regimenal measures, aided by alcoholic stimulants, and one of the least unpleasant of the tonics, as wine of iron or the calisaya bark. The regimen already recommended for prevention, is also required as a part of the curative treatment.

Certain modifications of treatment are demanded on account of the localization of the tubercles. Intra-cranial tuberculosis, as soon as diagnosticated, should be treated by pretty decided doses of iodide of potassium, though, unfortunately, there is little prospect of improvement. The glandular disease, whether bronchial or mesenteric, requires the iodide of iron, with or without that of potassium. Pneumonitis or pleuritis, so frequent a complication of pulmonary tuberculosis, requires emollient poultices, with moderate counter-irritation, and the judicious use of opiates with stimulants. The peritonitis occurring in abdominal tuberculosis, which is usually circumscribed, is best treated by fomentations and poultices, with opiates, and the diarrhœa by subnitrate of bismuth and chalk, five to ten grains of each, or the bismuth with Dover's powder; or a more active astringent.

CHAPTER IV.

SYPHILIS.

Syphilis in infancy and childhood presents itself under two forms, namely, the congenital and acquired; the former is the more frequent.

Etiology.—Congenital syphilis may be derived from either father or mother. Either parent, having previously had syphilis, may transmit it to the offspring, although at the time free from syphilitic symptoms. The mother, healthy at the time of conception, but infected with syphilis prior to the eighth month of gestation, may communicate the disease to the fœtus; syphilis contracted in the eighth or ninth month does not affect the fœtus. If both parents have syphilis, the infant is almost necessarily syphilitic; on the other hand, if only one parent is affected, the infant may or may not be contaminated. Sometimes, with such parentage, a part of the children are syphilitic, and a part healthy.

Acquired syphilis in infancy and childhood may be received through primary lesions—that is, by reception of the virus from a chancre or bubo; or it may be derived from certain of the secondary lesions. Inoculation by primary lesions may occur at the birth of the infant, from a syphilitic sore in the vagina or upon the vulva of the mother; inoculation in this manner is, however, rare. Children may also receive the virus from primary lesions on the persons of nurses or companions. Infection in this manner is sometimes accidental, and sometimes the result of criminal conduct. A chancre on the breast of the wet-nurse not very infrequently communicates syphilis to the nursling.

The contagiousness of "secondary manifestations," for a long time doubted, is now fully established. Syphilis may be communicated by the secretion or exudation of a mucous patch, or a secondary sore. Hence the danger of lactation by unhealthy wet-nurses, though they present no symptoms of recent syphilis. Excoriations or sores upon the nipple or breast of an infected wet-nurse may communicate the disease to the nursling; and, on the other hand, mucous tubercles or fissures upon the lips or tongue of the infected infant may be the means of contaminating a healthy wet-nurse. Many such cases are now contained in the records of medicine. Vaccination by means of the scab is also a mode by which constitutional syphilis may be communicated. For further particulars in reference to this subject the reader is referred to our remarks on vaccination.

Clinical History.—Syphilis occurring in the fœtus often destroys its life and produces miscarriage. The fœtus has a shrivelled and diseased appearance, its skin peels, the liver is occasionally indurated, and abscesses with spots of inflammation are sometimes observed in the thymus gland. So frequently is syphilis a cause of non-viability, that, as Trousseau has remarked, this disease should be suspected as the cause whenever a woman repeatedly aborts. Abortion from syphilis commonly occurs at or about the sixth month of gestation.

The viable infant, affected with syphilis, ordinarily presents, at birth, no symptoms or appearances which indicate the nature of the disease with which it is contaminated. But there are exceptions. Recently I was enabled to diagnosticate syphilis in an infant within a day after birth, by its small size and feebleness, and the appearance of large blebs of pemphigus upon the hands and feet, fingers and toes, over which the skin soon broke, leaving troublesome and bleeding sores; coryza commenced about the twelfth day. The parents of this child appeared healthy, but I could finally trace the syphilitic taint to the mother. Well-marked pemphigus in the new-born may be considered pathognomonic of syphilis. Bouchut saw a seven and a half months' infant born alive with an eruption of a copper-color upon the legs and arms, and onyxis upon the fingers and toes. Condylomata, mucous patches, and stains of a copper-color are the principal syphilitic affections, besides pemphigus, which have been observed at birth on the bodies of contaminated infants. It is stated that M. Cullerier, in ten years' attendance at the Hôpital de Louraine, met only two cases of syphilitic manifestations at birth, and Victor de Meric only two cases in forty-six infants, who were affected with congenital syphilis (*Bumstead*); but in the practice of others a larger proportion have exhibited symptoms at birth. Ordinarily the period in which congenital syphilis is first revealed by symptoms is between the fifteenth and fortieth days. Rarely the manifestation of the disease is delayed several months. M. Diday ascertained the time of the commencement of symptoms in 158 cases, as follows:—

Before the completion of one month after birth, in	86
" " two months "	45
" " three " "	15
At four months	7
" five "	1
" six "	1
" eight "	1
" one year	1
" two years	1

In cases of tardy commencement of syphilitic symptoms it is probable that the disease has been partially eradicated from the affected parent by appropriate treatment.

The nutrition of the infant who has inherited the syphilitic taint, but does not exhibit it at birth, is for a time good, but it begins to be impaired when the local manifestations of syphilis appear, or soon after. The system gradually wastes; the skin loses its fresh and healthy appearance, and becomes sallow, and, after a time, more or less wrinkled; the features become pinched or contracted, and wear a sad expression. M. Diday says: "Next to this look of little old men, so common in new-born children doomed to syphilis, the most characteristic sign is the color of the skin." Trousseau thus describes this discoloration of the surface: "Before the health becomes affected, the child has already a peculiar appearance; the skin, especially that of the face, loses its transparency; it becomes dull, even when there is neither puffiness nor emaciation; its rosy color disappears, and is replaced by a sooty tint, which resembles that of Asiatics. It is yellow or like coffee mixed with milk, or looks as if it had been exposed to smoke; it has an empyreumatic color, similar to that which exists on the fingers of persons who are in the habit of smoking cigarettes. It appears as if a layer of coloring had been laid on unequally; it sometimes occupies the whole of the skin, but is more marked in certain favorite spots, as the forehead, eyebrows, chin, nose, eyelids—in short, the most prominent parts of the face; the deeper parts, such as the internal angle of the orbit, the hollow of the cheek, and that which separates the lower lip from the chin, almost always remain free from it. Although the face is commonly the part most affected, the rest of the body always participates more or less in this tint. The child becomes pale and wan."

The infant whose system is profoundly affected by syphilis rarely smiles, and its voice is feeble and plaintive; its frequent whimpering cry is quite characteristic.

Coryza is one of the earliest and most constant of the local affections which occur in infantile syphilis. It is slight at first, attracting little attention from the parents, who are not aware of its significance, and usually attribute it to a slight cold; but it gradually increases. It gives rise to a secretion from the Schneiderian membrane, at first thin, but which becomes more consistent, and is attended by the formation of scabs. The thickening of the mucous membrane in consequence of the inflammation and the presence of crusts narrows the passage through the nostrils so as to produce snuffling respiration, and sometimes render nursing difficult. In severe cases respiration through the nostrils is almost wholly prevented, so that death may occur from inanition, unless the breast is milked into the infant's mouth or it is fed with a spoon; but ordinarily, even in grave coryza, it continues to nurse, though obliged often to release its hold of the nipple to obtain breath. It is when coryza begins to interfere with lactation that it first alarms the parents. The inflammation at the same time may affect the throat and larynx, causing hoarseness of the voice. Ulceration of the Schneiderian membrane and the subjacent cartilage or bone is rare in infancy or childhood, although cases occur which are even attended with more or less flattening of the nose. Diday believes that the discharge which accompanies coryza is in great part due to mucous patches developed on the Schneiderian membrane. The upper lip, over which the discharge flows, becomes red, excoriated, and more or less incrusted. The coryza, in most cases, coexists with other local syphilitic affections. Occasionally it occurs alone, and is the only evidence of the presence of the specific taint, except such as is afforded by the mal-nutrition and general appearance of the patient.

Mucous patches occur in most patients. They are developed either upon the mucous surfaces, or upon parts of the skin which are thin and exposed to friction, and such as are moistened by secretion or transudation from the vessels underneath. The most common seat of mucous patches is at the termination of mucous canals; but in infancy, on account of the peculiar delicacy of the skin, they may occur upon almost any part of the cutaneous surface. They are most common, however, around the anus, upon the vulva, scrotum, umbilicus, labial commissures, in the axillæ, and behind the ears.

Mucous patches. upon the skin present a rounded border, and are slightly elevated. Their color has been compared to that of the skin which has been softened by the prolonged application of a poultice. Erosions and cracks sometimes occur in the patches, from which a thin liquid exudes.

Upon mucous surfaces they are less elevated than upon the skin, and are prone to ulcerate. These ulcerations, commencing at the centre, extend, and soon the mucous patch disappears, and its site is occupied by an ulcer. The ulcer may be circular, oval, elliptical, crescentic, or irregular. The arches of the fauces are a common seat of mucous patches.

ROSEOLA is an occasional symptom of infantile syphilis. "It is distinguished," says Diday, "by patches of a bright rose-color, circumscribed, irregularly rounded, of various sizes (most frequently about as large as one of the nails); appearing, by preference, on the belly, lower part of the chest, neck, and inner surface of the extremities." The spots do not readily and fully disappear by pressure.

PEMPHIGUS appearing soon after birth has already been alluded to. Its most frequent seat, whether occurring after birth or as a subsequent manifestation, is the palms of the hands, soles of the feet, the fingers, and toes. This eruption commences by a violet tint of the skin, and in the course of twenty-four to forty eight hours a watery fluid collects underneath, which soon becomes turbid. The skin peels off, and sometimes an angry sore results, which bleeds readily when rubbed or pressed. In other and more favorable cases new skin takes the place of that which is lost. Pemphigus at birth is a precursor of death, but when it appears for the first time some weeks after birth, it is a less unfavorable prognostic. In cases of recovery it disappears, with proper treatment, in two or three weeks.

ACNE, IMPETIGO, and ECTHYMA are occasionally observed in children afflicted with syphilis. The indurated pustules of acne occur most frequently upon the shoulders, back, chest, and buttocks. The pus is sometimes absorbed, and in other cases discharged, leaving a small cicatrix, which, after a time, disappears. Impetigo appears most frequently upon the face, and occasionally upon the chest, neck, axilla, and groins. Unlike simple impetigo, the syphilitic impetiginous eruption is surrounded by a copper-colored areola. Ecthyma occurs upon the legs and buttocks chiefly. It commences as violet-colored spots, which are soon transformed into pustules. Ulcers succeed, which, in reduced states of the system, are apt to enlarge, and endanger the safety of the child. Of the three pustular eruptions, acne, according to Diday, is the least serious—indicating a "less confirmed diathesis." Ecthyma is the most serious, on account of the reduced state of system with which it is apt to be associated. Syphilitic papulæ and squamæ are rare in infants, but cases have been observed. Onychia occasionally occurs, though less frequently than in syphilis of the adult.

VISCERAL LESIONS.—The visceral lesions which occur in the syphilis of infancy and childhood are, suppuration in the thymus gland; gummy tumors in certain organs, most frequently the lungs and liver; increase of the connective tissue of the liver, known as syphilitic cirrhosis; partial perihepatitis, with depressions resembling cicatrices on the surface of the liver; peritonitis; periostitis, with thickening of the bone and exostosis.

Suppurative inflammation in the thymus gland is not common, or has not been frequently observed. When it is present, the gland sometimes presents its normal appearance externally, and the abscess is only discovered by incisions. Gummy tumors are white and spheroidal; some are as small or smaller than a pin's head, while others are as large as a pea, or even a hazel-nut. I have seen a considerable number of them not as large as a pin's head, in the liver of an infant. Gummy tumors, according to Lebert, consist "of loose fibrous tissue, made up of pale elastic fibres, inclosing in their large interspaces a homogeneous granular substance, the elements of which are less adherent to each other than in deposits of true tubercle." Lebert also, with other microscopists, discovered round granular cells in these tumors. According to Robin, gummy tumors "are made up of rounded nuclei belonging to fibro-plastic cells, or *cytoblastions;* of a finely granular, semi-transparent and amorphous substance; and, finally, of isolated fibres of cellular tissue, a small number of elastic fibres, and a few capillary bloodvessels."

Constitutional syphilis is one of the principal causes of waxy degeneration, and the spleen and liver of infants may be enlarged from this cause. Dr. Samuel Gee has expressed the opinion that in half the cases of hereditary syphilis the spleen is enlarged. (Lond. Lancet, April 13, 1867.)

Infiltration of the liver by fibrous substance was first noticed by Gübler. It is not common in the infant. A specimen, showing this lesion, was presented to the London Pathological Society in 1866, by Dr. Samuel Wilks. The following remarks by Dr. Wilks convey a good idea of the appearance and state of the liver in syphilitic cirrhosis: "Having dissected the bodies of several infants, who have died of congenital syphilis, I have found fatty livers, and an inflammation of the capsule; but in only two have I discovered adventitious products of a fibrous character. The present example, however, corresponds in every particular with the disease described by Gübler. It must be distinguished (at least as far as the naked eye appearance reaches) from the syphilitic disease of adults, of which many specimens have been before the Society. In these the organ is cicatrized on the surface, and contains distinct nodules of fibrous tissue; whilst in the disease of children, as in the present specimen, the whole organ is infiltrated by a new material, and it consequently becomes, as described by Gübler, hypertrophied, globular, and hard, resistant to pressure, and even when torn by the fingers, its surface receives no indentation from them; it is also elastic, and when cut creaks slightly under the scalpel. This was the form of disease in the present specimen. It came from a syphilitic child, a month old, in whom the liver could be felt enlarged during life, and when removed weighed a pound and a half. It was smooth on the surface, and so hard that it resembled rather a fibrous tumor than a liver." It is seen that the liver in the syphilitic child is liable to three distinct pathological processes, namely, gummy tumors, cirrhosis or fibroid degeneration, and waxy degeneration.

Syphilitic perihepatitis and periostitis are more rare in infancy and childhood than in adult life, but they occasionally occur. Prof. Simpson, of Edinburgh, considers peritonitis in the fœtus one of the results of syphilis, and the cause of its death.

Mr. Hutchinson, of London, has called the attention of the profession to certain observations of his, which, if corroborated, are important. According to him, hereditary syphilis becoming latent, sometimes manifests itself again after the age of five years, by another set of symptoms. One of these manifestations is a dwarfing of the incisor teeth, which are rounded and peg-like, with notched edges. On account of the shape and small size of the teeth, there are interspaces between them. This malformation is most marked in the central incisors of the upper jaw, and in certain cases it is limited to them, and it never appears in the other incisors unless it does also in them. Another symptom, which only appears in hereditary syphilis, is an interstitial keratitis occurring on both sides, and attended by the deposition of fibrin in the substance of the cornea. In a few weeks the inflammation declines, but a slight opacity of the cornea remains. The cerebral nerves may become affected, usually a single pair—if the auditory, deafness resulting; if the optic, dimness of sight. Occasionally there are other manifestations of syphilis in this period, as enlargement of spleen and liver, and nodes upon the long bones.

PROGNOSIS.—This depends in great part on the general condition of the patient. If there is much emaciation, and the symptoms indicate a deeply-seated cachexia, a considerable proportion perish. On the other hand, if the general health is not greatly impaired, although the local affections are pretty severe, the prognosis with correct treatment is good. The younger the infant, when the symptoms of syphilis appear, the more unfavorable, as a rule, is the prognosis.

TREATMENT.—Parents who beget syphilitic children ought, from a due regard for their offspring, to make use of anti-syphilitic remedies, although they present in their persons no evidences of syphilitic taint. A good prescription for the parents is one-sixteenth of a grain of corrosive sublimate in the compound tincture of bark, given twice or three times daily for several weeks. If the father has had syphilis, both parents should be subjected to this treatment, and it may be continued, at least on the part of the mother, during the first months of her gestation. So small a dose of the mercurial does not, in my opinion, materially increase the liability to miscarry. There is much more danger of miscarrying from allowing the syphilitic taint to remain uncontrolled. Some prefer the use of mercurial ointment in the treatment of pregnant women for syphilis, in the belief that it is less likely to produce abortion. It is used for this purpose in the proportion of one drachm to the ounce. It is equally effectual in the eradication of the syphilitic taint with the small dose of corrosive sublimate, recommended above for internal administration; but it is impossible to determine the quantity of mercury which enters the circulation when inunction is employed, and salivation is more likely to occur.

Syphilis in the infant requires mercurial treatment as in the adult. Mercury may be employed internally or by inunction. Some prefer inunction in the treatment of ordinary cases, in the manner recommended by Sir Benjamin Brodie. "I have spread," says he, "mercurial ointment, made in the proportion of a drachm to an ounce, over a flannel roller, and bound it round the child, once a day. The child kicks about, and, the cuticle being thin, the mercury is absorbed. It does not either gripe or purge, nor does it make the gums sore, but it cures the disease. I have adopted this practice in a great many cases, with the most signal success." Trousseau, on the other hand, discountenances the use of inunction, as mercurial ointment applied to the skin produces irritation, and increases the suffering and restlessness of the child. He prefers the following solution, which is known as Van Swieten's, for internal treatment:—

℞. Hydrarg. bichlorid. 1 part;
Aquæ 900 parts;
Spts. rectific. 100 parts. Misce.
Dose, one, or at most, two grammes (23 to 46 gr.) in milk, daily.

As regards the choice between inunction and internal treatment, it may be said that the former is preferable in very reduced states of system, and in those who are affected with diarrhœa. The ointment should not be applied to much of the surface; two or three square inches are sufficient. To avoid inflaming the surface, the position of it may be varied from time to time, and it need not be continuously applied. In cases other than those excepted above, I prefer internal treatment. Van Swieten's liquid may be given, or one of the following formulæ may be employed:—

℞. Hydrarg. cum cretâ gr. iij–vj;
Sacch. alb. ℈j. Misce.
Divid. in chart. No. xii. One powder 3 times daily.

℞. Hydrarg. chlor. corros. gr. i–ij;
Syr. sarsæ comp. ℥ij;
Aquæ ℥viij. Misce.
One teaspoonful 3 times daily.

Mercury, in whatever way employed, should not be discontinued entirely till several weeks after the syphilitic symptoms have disappeared; it is proper to continue it for a time, in diminished quantity, after the health seems fully restored.

When the mercurial is omitted, tonics are often required. The preparations of cinchona are useful in certain cases, as are also those of iron. If the patient remain feeble and pallid, presenting evidences of struma, cod-liver oil and syrup of the iodide of iron will be found beneficial continued for some weeks or months after the mercurial is discontinued. Attention should always be given to cleanliness and the hygienic management of the child. In some instances direct treatment of the local affections is serviceable. Injections of a solution of chlorate of potash into the nostrils have a good effect in syphilitic coryza, and the application to the inflamed surface daily of citrine or white precipitate ointment diluted with an equal amount of lard. Condylomata or mucous patches seated upon the cutaneous surface may be dusted with calomel. At my clinique in April, 1871, a child two years and ten months old was presented, with a large condylomatous outgrowth near the anus. The history of the child showed that in all probability the disease had been contracted within a year from syphilitic children in one of the public institutions. Within three weeks this affection nearly disappeared by dusting upon it calomel daily, with appropriate internal treatment.

SECTION II.

ERUPTIVE FEVERS.

CHAPTER I.

MEASLES.

THE disease known in the vernacular as measles has also the names rubeola and morbilli. It is a common exanthematic affection, occurring at any age, but most frequently in childhood. It affects once the majority of mankind. Writers recognize three stages of measles: first, that of invasion, which ends with the appearance of the eruption; secondly, the eruptive stage; and thirdly, the stage of decline or desquamation.

SYMPTOMS.—This disease commences with such symptoms as usually occur in mild but pretty general inflammation of the air-passages, namely, cough, fever, anorexia, and thirst. The eyes present a suffused, moderately injected, and brilliant appearance, and the buccal and faucial surface is injected. The Schneiderian membrane, and that lining the larynx, trachea, and bronchial tubes, participate in the increased vascularity. The cough at first is dry, and sometimes distinctly croupy. Catarrhal or false croup, indeed, is not infrequent in the initial period of measles. The cough is attended by little acceleration of respiration, and by little or no pain in the respiratory movements. If auscultation is practised at this early stage, we observe the vesicular murmur, somewhat harsh in character, and sometimes sonorous and sibilant râles. A little later, râles of a moist character appear.

The patient, if old enough, commonly complains of headache, and of dull pain in the epigastric region or the centre of the sternum, due to the bronchitis. With these local symptoms febrile reaction occurs. The temperature rises to about 102° or 103°, as indicated by the thermometer in the axilla. The pulse numbers from 110 to 130 per minute. The fever is somewhat greater than in primary tracheo-bronchitis, except when the bronchitis becomes capillary, but it is less than in most cases of scarlet fever.

The fever in the premonitory stage of measles after the first day is not uniform. It is attended by remissions and exacerbations, the former occurring in the first part of the day, the latter in the evening. Sometimes two exacerbations occur in the day. The face is flushed and somewhat swollen, especially during the times of increase in the fever, and the child is drowsy or restless. Vomiting, so common a symptom in the commencement of scarlet fever, occasionally occurs in measles. While in scarlet fever this takes place in the first twenty-four hours, in measles it occurs with about equal frequency at any period previously to the eruption. It was present during the first stage, sometimes almost as late as the eruptive period, in thirteen, and was absent in twenty-three cases, of which I have preserved records.

The duration of the first stage varies in different cases. It is usually from two to five days, with an average of about four. Occasionally it is more protracted on account of some disturbance in the economy, either from exposure to cold or other cause, which prevents the necessary afflux of blood towards the surface, and retards the eruption. In eighteen cases in my practice in which the duration of the cough previously to the appearance of rash was accurately ascertained, the time varied from one to five days, with an average of three and one-third; in ten other cases it had continued, the parents stated, about a week, and in five, from one to two weeks, previously to the eruption.

The eruption commences, when the disease pursues its normal course, upon the forehead and neck, then the face, and gradually extends downwards, occupying from twenty-four to thirty-six hours in passing over the trunk and limbs. It appears first as indistinct red points not more than a line in diameter, which increase in size and become more distinct. Their borders are uneven or irregular, or they are finely notched; their general shape is, however, circular, except as two or more unite, when they may assume any form. The crescentic form which writers describe is due to the union of two points of eruption. The largest of these spots, when there is no coalescence, do not exceed a quarter of an inch in diameter, and many are much smaller. Frequently in plethoric children, if there is much fever, there is continuous redness over several inches of surface. The eruption is then confluent. This form is often observed upon parts of the surface where the capillary circulation is most active, when it is discrete elsewhere. In some of these cases, diagnosis of measles from scarlet fever is attended with difficulty.

The rubeolous eruption is slightly elevated. This is not appreciable to the sight, but can be ascertained by passing the finger slowly over the skin, when a little roughness is felt at the point of eruption. Sometimes the elevation, especially in the commencement of the eruption, is not appreciable, even to the touch. The eruption is broad and flat, never acuminate, never changing its form to the vesicular or pustular. It disappears by pressure, and immediately reappears when the pressure is removed. It has been compared in appearance to flea-bites. Small, pointed, papular, vesicular, or pustular eruptions are sometimes seen in connection with those of measles, but they are accidental, occurring in other states of system as well as in measles, if there is the same augmented temperature.

In the commencement of the eruptive period, the severity of the constitutional and local symptoms increases. The pulse and temperature correspond with the character which they presented during the exacerbations of the first stage. The features are slightly swollen; the eyes still watery and sensitive to light; the conjunctiva, ocular and palpebral, and the mucous membrane of the cavity of the mouth and of the air-passages, continue injected. The tongue is covered with a moist thin fur, and its papillæ are prominent, though less so than in scarlet fever. The cough continues frequent, and is seldom attended with much expectoration, in uncomplicated cases; often there is no expectoration whatever. The appetite is lost, but drinks are readily taken on account of the thirst. Diarrhœa sometimes occurs on the first day of the eruption, but it lasts only a few hours, and, if the disease pursues its usual course, abates of itself. With the exception of this, the bowels are regular, or a little constipated during the eruptive period.

On the second day of the eruption, or sixth of the fever, the symptoms begin to abate. The pulse is less accelerated, and the temperature diminishes; the cough is less frequent and is easier, and the flushed and swollen appearance of the face declines. By the close of the third or on the fourth day, the rash has disappeared in the order in which it extended over the body. There only remain faint maculæ, which in the course of a day or two fade completely.

With the disappearance of the rash, the fever nearly or quite ceases, but a slight and painless cough continues for several days.

Occasionally the eruption presents a livid appearance; this is the rubeola nigra of writers. From cases which I have observed, it is my opinion that this should not be considered a distinct species in the vast majority of cases, but that the dark color is due to internal inflammation, usually capillary bronchitis or pneumonia, which prevents full oxygenation of the blood. Rarely rubeola nigra is due to the vitiated state of the blood, or the malignant nature of the disease. The course of the eruption in this form of measles is somewhat different; it continues longer, fades more slowly, and does not disappear so readily on pressure. Traces of it are observed a week or more after its first appearance; it is apt to be fatal. Measles may present this form from the beginning, or commencing as vulgaris, it may pass into rubeola nigra.

Measles may be irregular in form, but aberrations are less frequent than in scarlet fever. Writers describe measles without catarrh, and, on the other hand, measles without the eruption. But positive diagnosis in such cases must be difficult. It is probable that simple catarrh and roseola have sometimes been mistaken for the two forms of irregularity mentioned. But when a child, in a family of children affected with measles, presents all the symptoms of that disease, except the catarrh or except the eruption, the diagnosis of irregular measles would, as a rule, be correct.

Occasionally the stage of invasion is very short, or even absent. In one case the parents informed me that the catarrhal symptoms began on the day when the eruption appeared. Convulsions sometimes occur at the commencement of measles, as well as during its progress. A single convulsive attack at the commencement of measles is usually not dangerous; when repeated, it is more serious; it is also more serious when it occurs in the course of measles. In certain cases the eruption appears in an irregular and partial manner, occurring, perhaps, at a late period, and indistinctly upon the trunk alone, or upon the trunk and partially upon the legs. In many cases of deferred or partial eruption there is internal congestion or inflammation of some part, which causes withdrawal of blood from the surface, and thus prevents the normal development of the rash.

When the eruption disappears, the third stage commences, that of desquamation. It is characterized by a scanty furfuraceous exfoliation of the epidermis. The desquamation is seldom as great as in scarlet fever, and it occurs most where the eruption has been thickest and the epidermis most inflamed. Exfoliation occurs between the fourth and seventh days after the commencement of the eruption, the eighth and eleventh of the disease. In some children it does not take place, or is so slight, as not to be observed.

With the disappearance of the rash, the symptoms rapidly abate. The pulse becomes more natural, the temperature is reduced, the digestive organs return to their normal state, and convalescence is established. The cough continues several days after the other symptoms abate, but it is less and less frequent, and is not painful.

COMPLICATIONS.—The complications of this disease are important. Much of the success of the physician in the management of measles depends on a correct diagnosis and understanding of them. The most frequent of these complications are bronchitis and broncho-pneumonia. Slight bronchitis is common in measles, but if it increase so as to cause embarrassment of respiration, and become a source of danger, it is properly a complication. This complication, as well as pneumonia, may occur at any period of measles, but it commences most frequently in the first stage. Occurring in the first stage, it may prevent the regular appearance of the rash; if in the second, it often causes retrocession of it.

When bronchitis becomes really serious, it usually has invaded the minute bronchial tubes. This disease, designated capillary bronchitis or suffocative catarrh, I have elsewhere described. The clinical history of fatal bronchitis, as a complication of measles, is as follows: The respiration, at first not notably altered, becomes, by degrees, accelerated, and the patient more and more fretful. The pulse, instead of becoming less accelerated, as after the first days of simple measles, is daily more rapid, and the respiration more frequent and labored. The dyspnœa gradually increases, the infra-mammary region is depressed during each inspiration, and the subcrepitant râle is heard on both sides of the chest. There is, probably, collapse or inflammation of some of the lobules. Finally the prolabia and fingers become livid, and death occurs from apnœa. Capillary bronchitis is diagnosticated from pneumonitis by the physical signs. It is in the young child more dangerous than that disease, unless perchance the latter be double. A large majority of those affected under the age of three years, die. The anatomical characters of fatal bronchitis occurring in connection with measles, I have had an opportunity to inspect. In an infant who died with this complication in the Infants' Hospital in the spring of 1867, there were evidences of continuous inflammation from the epiglottis to the minutest bronchial tubes.

Pneumonia as a complication does not differ materially from the idiopathic form, except that it is more protracted and fatal. Its form is in most cases catarrhal, resulting from an extension of the bronchial inflammation.

The next most frequent serious complication of measles is entero-colitis. This may commence at any period during the course of the disease. If the colon is more especially the seat of inflammation, the evacuations contain mucus and blood, unless in young children, in whom the stools, even in severe colitis, commonly have a green color. The anatomical character of this complication varies in different cases, like the idiopathic form of inflammation. Sometimes there is simple arborescence of the intestinal mucous membrane, with tumefaction of its follicles; in other cases, in addition to increased vascularity, the mucous coat is softened and thickened; and in others still, especially if the inflammatory action has been somewhat protracted, ulceration occurs, for the most part in the site of the solitary glands. Exceptionally, in fatal cases of measles attended with diarrhœa, no vascularity is observed after death, although the intestine may be somewhat thickened and softened. In these cases the diarrhœa may have been non-inflammatory or inflammatory, the injection of the vessels having disappeared after death.

Severe and obstinate diarrhœal affections occurring with measles, usually commence as the primary disease is about declining. They then become sequelæ, ending fatally in many instances several days or perhaps weeks after the disappearance of the eruption. Diarrhœal attacks, occurring in, or previously to, the eruptive stage, are, as a rule, mild and easily relieved.

In some grave cases, measles have a tendency from the first to affect the internal organs more than the surface. There then co-exist bronchitis, pneumonia, and entero-colitis, with indistinctness of the eruption on the skin. Such complications render a fatal result highly probable.

Another very fatal complication and sequel is true croup, commencing when rubeola is beginning to decline; but it is less frequent than pneumonia or entero-colitis. In catarrhal or false croup, which, as has been previously stated, is not infrequent at the commencement of measles, the cough has a loud, ringing character. In true croup, on the other hand, it is hoarse or harsh, and less distinct, on account of the presence of the pseudo-membrane in the larynx. True croup, always a grave disease, is more serious when it occurs as a complication of measles than in the idiopathic form, not only because the blood is vitiated and the system reduced by the primary affection, but because the inflammation of the mucous surface is in general more extensive, as is also, I believe, the pseudo-membrane. This membrane in the croup of measles I have seen extend so far down the air-passages, that tracheotomy could not have been attended by any decided amelioration of symptoms. This complication, though always grave, is not, however, necessarily fatal. I have known cases recover by ordinary treatment, when for days there had been dyspnœa and other evidences of a pretty firm pseudo-membrane. True croup causes continuation of the fever, which had perhaps begun to abate.

Diphtheria, when epidemic, also frequently complicates measles. Much of the mortality from measles in this city, between the years 1860 and 1865, was due to this cause. In cases observed by myself, diphtheria usually began while the fauces were still inflamed, and sometimes before the eruption had begun to fade.

These are the most common complications of measles. There are others of less frequent occurrence, among which may be mentioned congestion of the brain, with or without serous effusion. Stomatitis, pharyngitis, and otitis are occasional complications. Rarely, also, purpura, attended by hemorrhages from the different mucous surfaces, occurs in connection with measles. This complication is, however, more frequent in certain other constitutional diseases, as scarlet fever, and especially variola.

It is seen that the inflammations which are apt to occur in the course of measles are chiefly of the mucous surfaces. In scarlet fever, on the other hand, the inflammations are serous.

There are other affections, originating in measles, which are rather sequelæ than complications. Gangrene of the mouth is one which, as stated in another part of the work, is more apt to occur after measles than any other disease. Ophthalmia commencing in measles often persists for weeks or months. It may give rise to granulations of the lids, and cases have been reported of violent inflammation of a purulent character, producing ulceration of the cornea, and destroying vision. The ophthalmia is sometimes very intractable. Inflammation of the Schneiderian membrane, commonly present during measles, sometimes continues as a sequel, extending back as far as the Eustachian tube, where it may cause swelling, with impairment of hearing, and forward to the lip, where it may produce chronic eczema.

ANATOMICAL CHARACTERS.—I have made, or witnessed, according to remembrance, some six post-mortem examinations of those who have died in, or immediately after, an attack of measles. In all there were lesions due to complications. Indeed, death directly from measles is so rare that few have had an opportunity of studying the anatomical characters which are peculiar to this affection. In those who have died without any obvious coexisting disease, and these cases chiefly occur in the malignant form, there has been congestion of the internal organs, especially marked in the lungs, and sometimes the tissues appeared softened. The blood, also, in the malignant form, has a darker hue than natural, and ecchymotic patches have been observed upon the mucous surfaces and elsewhere, corresponding in character with the petechiæ under the skin which sometimes occur in this form of measles. In cases resulting fatally from bronchitis or pneumonia the bronchial glands are commonly tumefied in the same manner as the mesenteric glands are enlarged in enteritis, and the glands of the meso-colon in dysentery.

NATURE.—Rubeola, like the other exanthematic fevers, is due to a materies morbi, the exact nature of which is unknown. It is both inoculable and infectious. It has been inoculated by the serum from vesicles which sometimes occur in connection with the rubeolous eruption, and also by the blood from a patient. Inoculation does not appear to moderate the disease, and as measles, when contracted in the ordinary way, is not in itself dangerous, but dangerous only from complications, inoculation is not performed, except as a matter of scientific interest. The usual mode of propagation is by infection. It is communicated both by the breath and clothing. By fomites the virus is sometimes conveyed a long distance. The question is still undecided whether rubeola does not sometimes occur spontaneously. I have met cases, and have been informed of others, one especially, occurring in a sparsely settled portion of the country, in which there was apparently no exposure, and I incline to the opinion that its origin *de novo* is possible, though not frequent.

The period of incubation of measles is usually from ten to fourteen days. In cases observed in the children's department of Charity Hospital, this period was ascertained to be about twelve days. In those who have been inoculated, the incubative period is said to have been about one week. Rubeola prevails epidemically, like the whole class of infectious diseases, and in different epidemics the type varies somewhat, as well as the character of the complications.

DIAGNOSIS.—The diagnosis of measles, previously to the eruption, is often difficult. The catarrhal symptoms then predominate, and these are such as may occur independently of any constitutional or blood disease. The first stage, therefore, of measles, is often mistaken for coryza, or mild bronchitis. The points of differential diagnosis are the suffused appearance of the eyes, the greater degree of fever on the first day than would be likely to arise from so moderate an amount of local disease, and on subsequent days remission and exacerbation of the fever. Measles in the first stage has been mistaken for remittent fever. The catarrhal symptoms should prevent such an error.

Sometimes roseola closely resembles measles in appearance, but the rash of roseola appears within a few hours after the commencement of febrile symptoms, and almost simultaneously over the whole body, and without those local symptoms referable to the mucous surfaces, which characterize measles.

Variola on the first day of the eruption has sometimes been diagnosticated as measles. I recollect once being called to an infant with fatal confluent smallpox, who was said to have measles. A physician, a few days previously, observing the red points in the commencement of the eruption, had made this absurd diagnosis, and, predicting a favorable result, had not thought it necessary to repeat his visit. In case of doubt, it is the part of prudence to defer making a positive diagnosis. A few hours suffice to show the distinctive characters of the rubeolous and variolous eruptions. But the anxiety of friends often necessitates the expression of an opinion. The absence of catarrhal symptoms, the earlier appearance of the eruption, and its papular feel under the finger in smallpox, enable us to discriminate between the two diseases in the commencement of the eruptive stage. Moreover, the symptoms in the initial periods are different, as will be seen in our description of smallpox.

PROGNOSIS.—This is favorable, provided that there is no serious complication. With internal inflammatory complication, on the other hand, the disease becomes much more grave. A large proportion thus affected die. The prognosis is also less favorable in feeble children with scanty eruption, or an eruption appearing at a late period and irregularly. Dyspnœa, persistent and great, acceleration of pulse, and coma, indicate an unfavorable ending. Convulsions occur much more rarely in the course of measles than in scarlet fever, and when they occur after the initial period they usually end in coma and death.

TREATMENT.—Uncomplicated measles requires no medicinal treatment except to palliate symptoms. The child should be kept in an airy apartment, at a uniform temperature of about 68°. A temperature so elevated as to be uncomfortable to the nurse is injurious to the patient. But while the popular idea is erroneous, that he should be kept in a heated atmosphere, it is correct that currents of air and sudden reduction of temperature are dangerous. A violent and fatal attack of croup occurred in my practice in a girl of fifteen, in consequence of exposure at an open window during the period of desquamation. The diet should be mild, and for the most part liquid. The patient, indeed, refuses solid food, but, on account of the thirst, takes liquids more readily. Farinaceous substances, with milk, afford sufficient nutriment in ordinary cases. If the previous health has been poor and the vital powers reduced, or if there is a complication, more sustaining diet is required. Stimulation by wine or brandy is needed in some of these cases. During the two or three weeks succeeding an attack of measles, care should be taken to avoid exposure to cold, or changes of temperature, since during this period mucous inflammations are so apt to occur.

The cough in most cases requires treatment, inasmuch as the suffering of the child and loss of sleep are largely due to this symptom. Demulcent drinks, as flaxseed tea, infusion of slippery-elm bark, or solution of gum Arabic, are useful, to which, to render them more palatable, lemon-juice may be added. A small Dover's powder, or the following mixture given occasionally, relieves the severity and diminishes the frequency of the cough:—

℞. Tinct. opii camphorat.,
Syr. scillæ,
Syr. ipecac., āā ℥ss;
Spts. æther. nitr. ʒij. Misce.

Dose, one teaspoonful to a child of five years, repeated according to circumstances.

As the chief danger in measles is from inflammation of the respiratory organs, local treatment directed to the chest is important. The chest should be covered with oil-silk, unless in the mildest cases. This increases the amount of eruption upon the surface underneath, and, I believe, tends greatly to prevent complication by bronchitis and pneumonia. If the eruption is tardy in its appearance, or indistinct, it is well to produce moderate counter-irritation by some gentle irritant underneath, as camphorated oil, to which one-third part of turpentine is added.

Affections, which complicate measles, should receive, for the most part, such treatment as is appropriate for them when idiopathic. Secondary diseases, however, require sustaining measures more than primary. In bronchial and pulmonary inflammations, which, if they occur early in measles, prevent the regular appearance of the eruption, or, if in the eruptive stage, cause its disappearance, prompt counter-irritation over the chest, by sinapisms or otherwise, is required. Trousseau states that he has derived benefit in these cases, from what he designates urtication. This is produced by stroking the chest two or three times daily with the nettle (urtica dioica or urtica urens). This causes a prompt and abundant eruption, and with a less amount of suffering than one would suppose. The fever abates, and the respiration becomes more natural in proportion to the amount of nettle-rash. On the second day the effect is less than on the first, and after three or four days, says Trousseau, no further irritation results from the nettle. When counter-irritation is produced, by whatever method, the chest should be covered with a warm and soft poultice, as the ground flaxseed; derivatives to the extremities are useful in such cases. In capillary bronchitis and pneumonia stimulating expectorants are required, as senega and carbonate of ammonia.

As regards the treatment of other complications, the appropriate measures are detailed elsewhere.

CHAPTER II.

SCARLET FEVER.

THE terms scarlet fever, scarlet rash, and scarlatina are identical. They are employed to designate one of the most frequent and fatal of the contagious diseases, a disease which may occur at any age, but is most common in childhood, an exanthem attended with more or less pharyngitis. In this city, on account of its great frequency, and its large percentage of fatal cases, it causes more deaths than any other contagious affection. Though not more common than measles, it is attended, with us, by more than double its mortality.

There is no disease that presents a greater difference, as regards character and severity of symptoms, than scarlet fever, and this has led to the recognition of different forms of it. Rilliet and Barthez describe two, the normal and abnormal; Meigs two, the mild and grave; and most other writers, three or more. I shall, for convenience, follow Bouchut, who makes three varieties, namely, the regular, irregular, and malignant.

SYMPTOMS. *Regular Form.*—Scarlet fever usually begins abruptly. It is possible, often, to tell the exact time of its commencement. If there are premonitory symptoms, they are ordinarily slight, so as scarcely to attract attention, amounting to little more than dulness, or the appearance of fatigue. In some the first symptom is chilliness, and occasionally a distinct chill is experienced. This is the ordinary mode of commencement in the adult. With or without the chilliness, fever, usually intense, arises, accompanied by such symptoms as ordinarily occur in a febrile state of system, such as cephalalgia, perhaps delirium, anorexia, thirst. The pulse rises to 110, 120, or more, per minute; the skin is hot, face flushed, the eyes bright, and occasionally more or less suffused. In many, there is sudden starting or twitching, with a degree of stupor, showing that the cerebro-spinal system is profoundly affected.

In most cases there occurs within the first twenty-four hours a symptom which has considerable diagnostic value, namely, vomiting. In 117 cases in which I have recorded its presence or absence, it occurred in 90, usually not at the very commencement, but within the first twelve or eighteen hours. It commonly occurred before the appearance of the rash, but not always. In a few of the cases it is recorded as a symptom of the second day. Vomiting at this period is, probably, in most cases, sympathetic, due to the effect of the specific virus of the disease on the brain. It is not a severe symptom, occurring in most cases but once or twice. Great and persistent irritability of stomach indicates a serious form of scarlet fever, and is, therefore, prognostic of an unfavorable ending. When this symptom is absent or slight, or there is merely nausea, I have found the case ordinarily mild, so that, as regards the frequency of vomiting, the statistics of different epidemics vary according to the mildness or gravity of the type. The bowels are regular or somewhat constipated in this form of scarlet fever, or if diarrhœa occur, it is slight and transient.

When the symptoms described above have continued six to eighteen hours, the rash appears. It is first observed about the ears, neck, and shoulders, in reddish indistinct patches, fading into the normal hue. These patches extend and unite, and in the course of a few hours the trunk and upper extremities, and finally the legs, are covered. The scarlatinous rash bears considerable resemblance to that produced by external heat or the redness from a sinapism, but there are numerous minute points of a deeper or duskier red than the surface generally. On passing the finger over the eruption, no distinct prominences are observed, but a sensation of roughness is sometimes imparted from engorgement of the cutaneous papillæ. The rash disappears by pressure, but in robust children, and in favorable cases, it immediately returns when the pressure is removed. Slow return of the rash is evidence of sluggish circulation, and, when marked, it indicates the malignant form of the disease. The rash gives rise to an itching or burning sensation, which adds greatly to the discomfort of the patient. The degree of redness is not uniform over the surface, and sometimes, especially in mild cases, it is absent in places.

Early in the disease, even before the cutaneous eruption, the buccal and faucial mucous membrane presents a pretty general red appearance, and the papillæ of the tongue are elevated. Pharyngitis has already commenced, with more or less stomatitis and tonsillitis. The inflammation renders deglutition painful, so that difficulty is often experienced in giving the necessary drinks. This state of the buccal and faucial membrane continues through the disease. There is sometimes a slight fibrinous exudation over the tonsils; the tongue is covered with a moist fur, and the secretion from the follicles of the inflamed surface is increased and mucopurulent. The Schneiderian membrane also participates in the inflammation, and, as the disease advances, a thin, irritating discharge, containing pus cells, flows from the nostrils.

The temperature in the first days of scarlet fever is ordinarily from 102° to 105°, sometimes as high as 107°. The cutaneous transpiration during this period is nearly checked, so that the skin is hot and dry. The respiration is moderately accelerated, but not so as to attract attention, unless there is a complication; often there is slight cough from mucus in the throat or bronchial tubes. Bronchitis, common in measles, and giving rise to prominent symptoms in that disease, is either absent or slight in scarlet fever.

The symptoms pertaining to the digestive system during the initial period of scarlet fever have been sufficiently described. The subsequent symptoms do not differ materially in regular scarlet fever, except that there is no vomiting. The lips are dry and often cracked. The inflammation of the mouth and throat continues unabated, with anorexia and thirst. The urine is high-colored, and in robust children, during the first days of scarlet fever, it frequently deposits the urates on cooling.

The symptoms continue with undiminished intensity for a period of from four to six days, when the fever begins to abate, the pungent heat becomes less, and the rash fainter. There is a gradual decline of the disease, which, in its inception, was so abrupt. In mild, and even pretty severe cases, which pursue a regular and favorable course, convalescence commences by the close of the first or beginning of the second week. In the second week, the rash, becoming less and less distinct, finally disappears, as do also the redness and swelling of the buccal and faucial membrane. The engorgement of the papillæ of the tongue and that of the tonsils subsides; the appetite returns; the countenance brightens, and becomes natural, and the child who, during the height of the fever, scarcely noticed objects, or noticed them with indifference, or even repugnance, can be amused as before his sickness.

The period of desquamation succeeds. Exfoliation of the epidermis occurs over the whole body. This commences about the face and neck, and it occupies several days, during which there is progressive improvement in the condition of the child. Where the skin is thin, the epidermis, as it is detached, presents a furfuraceous appearance; where it is thick, as upon the palms of the hands, and soles of the feet, it separates in a layer of considerable thickness.

Such is a brief account of scarlet fever, when it pursues its normal course, without complication or sequelæ. But there is no disease which has so many unfavorable complications and sequelæ as this. The liability to these renders the prognosis in all cases doubtful, and in many instances they are the immediate cause of death. They occur both in mild and severe cases of scarlet fever.

The great difference in different cases of scarlet fever, as regards intensity of symptoms, is well known. It is sometimes so mild, its characteristic features so slight, that diagnosis is necessarily uncertain. Examples in corroboration of this statement are not infrequent. In the spring of 1866 I was called to an infant thirteen months old, who had slight pharyngitis, and an indistinct rash over a part of the surface. In two days the eruption had disappeared, and soon after the health was apparently fully restored. Diagnosis would have remained doubtful, except for sequelæ. In another instance, two children passed through the entire course of scarlet fever, playing every day in the street. Although the intelligent grandmother saw the rash upon them, its nature was not suspected till nearly two weeks afterwards, when one was taken with fatal nephritis and general anasarca. In cases so mild as these, the heat of surface is not greatly increased, nor is the pulse much accelerated. There is no restlessness, nor is the digestive function materially impaired. The rash does not have so deep a color, nor is it so continuous over the surface, as in cases of ordinary gravity. The patient begins to improve in from two to four days, and is soon well. So mild a form of scarlet fever is, however, quite exceptional, but there are all gradations, from this mildness to that malignant form which I shall presently describe.

There is usually considerable faucial inflammation, even when scarlet fever pursues a regular and favorable course. If the pharyngitis is intense and protracted, many writers designate the disease scarlatina anginosa. There is, in these cases, not only general and pretty severe inflammation of the mucous membrane of the fauces, with swelling of the tonsils, and submucous infiltration, but also more or less tumefaction around the angle of the jaw, due to extension of the inflammation to the lymphatic glands, and cellular tissue of the neck. In these cases, the suffering of the patient is greatly increased by the amount of local disease. The adenitis and cellulitis, unless slight, do not subside with the disappearance of the rash, or they subside more slowly. They render the febrile movement more protracted. The swelling due to these inflammations often continues one or two weeks after the disappearance of the rash, or even longer, when it disappears by resolution, or more rarely by suppuration, the abscess opening externally.

Irregular Form.—The irregular form of scarlet fever is commonly due to some perturbating cause. This cause is often a pre-existing or coexisting disease, or, if not actual disease, at least disordered state of system. For example, a little girl, in my practice, had the symptoms of scarlet fever, such as febrile movement and inflammation of the buccal and faucial surface, nearly a week before the scarlatinous eruption appeared. During this period there were symptoms of enteritis, which declined when the rash occurred. The abdominal affection was the apparent cause of the irregularity in the fever. If scarlet fever occurs during an attack of entero-colitis, there is frequently no eruption. Most practitioners have met cases like the following, which I now recall to mind: In a family where scarlet fever was prevailing, a little child, early after the commencement of symptoms which seemed to be plainly referable to the exanthematic affection, was seized with vomiting and purging, and the latter continued two or perhaps three days, when death occurred. There were the symptoms and appearances of severe scarlet fever, but without the eruption. In another instance, an infant in the warm months having protracted entero-colitis, the usual summer epidemic of this city, was apparently affected with scarlet fever, which was present in the family. There were the characteristic symptoms, but the diarrhœa continued, and there was no rash.

In those that are much reduced by any antecedent disease, as phthisis, or that have a disease, chronic or acute, which produces a decided afflux of blood towards an internal organ, the eruption is commonly tardy in its appearance, indistinct, or wholly absent. The diseases which most frequently render scarlet fever irregular are those of an inflammatory nature. Some affections, occurring in connection with scarlet fever, do not change its symptoms, but themselves undergo modification. Scarlet fever occurring in a child having pertussis does not itself undergo any material change. The cough, not the fever, is modified (rendered milder) during the coexistence of the two.

Scarlet fever may, also, be irregular in those that are robust and free from any other disease assuming this form, without any appreciable perturbating cause. In 1867 I attended a young lady, whose previous health was excellent, and whose brother was sick at the time with scarlet fever. This patient had considerable fever, with pretty severe pharyngitis, and though her surface was repeatedly examined, no eruption could be discovered. Two weeks subsequently she became affected with severe nephritis, anasarca, effusion into at least one of the pleural cavities, and probably into the pericardium, the case ending fatally.

Rilliet and Barthez mention the irregular and incomplete character of the eruption in second attacks of scarlet fever, which, though uncommon, are met from time to time. Scarlet fever occurring a second time, sometimes presents all the features of the regular disease, and pursues its normal course, but it is much more apt to be incomplete and irregular than the first attack. It is more apt to be irregular if the interval between the two has been short, than if several years have elapsed.

Malignant Form.—This form of scarlet fever is in some epidemics common, while in others it is rare. It usually commences with severe symptoms, those pertaining to the nervous system predominating, such as intense cephalalgia, with delirium. Many pass rapidly into coma, and die within two or three days. They succumb to the virulence of the scarlatinous poison, while the disease is still in its commencement. The rash in malignant scarlet fever is dusky. It disappears by pressure, and returns slowly when the pressure is removed. There is, therefore, extreme sluggishness of the capillary circulation. In some there is great restlessness. If placed in one position on the bed, they soon throw themselves, in a half-conscious or unconscious state, into another. They do not speak at all, or they mutter like those affected by the graver forms of typhus, calling the names of playmates, or talking about things which interested them when well. There is great elevation of temperature, the thermometer, placed in the axilla, indicating 103°, 105°, or even 107°, and the heat of surface is pungent, except when the case approaches a fatal termination. The pulse from the first is rapid, numbering from 130 to 160 per minute. Sometimes there is great heat of head and body, while the limbs are cool. This is an unfavorable sign.

Severe and dangerous nervous symptoms, as convulsions and coma, occur chiefly within the first three or four days. After this period the danger is mainly from exhaustion. Those who survive the onset of the disease, often have, in the course of a few days, severe pharyngitis, with inflammation of the lymphatic glands, and cellular tissue around the angle of the jaw, accompanied by external swelling. The pharyngitis is attended by more or less secretion of mucus or muco-pus, which, sometimes collecting around the entrance of the larynx, causes noisy respiration, or even, if the system is greatly prostrated, embarrasses respiration by entering the larynx. The chief danger, however, from the pharyngitis, is due to the exhaustion which it causes. By rendering deglutition difficult, it interferes seriously with nutrition.

COMPLICATIONS.—Complications may occur in any form of scarlet fever, but they are most frequent in malignant or grave cases. The most common and serious complication, as regards the nervous system, is clonic convulsions. These occasionally occur at the commencement of the disease, before the appearance of the rash, and many then recover, but I have not seen, nor have I heard, in my intercourse with physicians, of any case which recovered when convulsions occurred after the complete development of the eruption. On the other hand, some of the physicians of this city, of largest experience, inform me that they consider convulsions during the eruptive stage an almost certain precursor of death. Convulsive attacks in scarlatina are probably due, in part, to congestion of the nervous centres, for we sometimes find, in young children, at the time of the seizure, and immediately before it, the anterior fontanelle prominent, and forcibly pulsating. The convulsions uniformly increase the congestion, but, as the latter antedates the former, its causative relation seems to be established. But the most important element in the causation of convulsions in scarlet fever is, probably, the presence in the blood of the scarlatinous virus. This, whatever its exact nature, may, in my opinion, cause convulsions, with or without the co-operating influence of congestion, as urea gives rise to them in cases of uræmia. Convulsions occurring at the commencement of scarlet fever are usually single. If repeated, they become more serious. Convulsions after the appearance of the eruption, either end at once in coma, or they return at short intervals, with gradually increasing drowsiness, till coma supervenes.

The anginose affection in scarlet fever may be so severe, or assume such features, as to constitute a complication. It may become more serious than the primary disease itself, so as to require the chief treatment. During the recent epidemic of diphtheria in this city many cases were observed in which diphtheria and scarlet fever coexisted. As has been stated elsewhere, a pseudo-membranous formation upon the faucial surface, especially over the tonsils, is not uncommon in severe anginose scarlet fever, but is soft or pultaceous, in isolated points or patches, and easily detached. On the other hand, in the cases to which I have alluded, of diphtheritic complication, the pseudo-membrane is firm and thick, penetrating the mucous membrane so as to produce bleeding when forcibly detached, as in primary diphtheria. In one instance in my practice the coexistence of diphtheria and scarlet fever was very apparent. Two children in a family died after a short attack of malignant scarlet fever. Their throats were not examined. Another child took the disease, and, being longer sick, it was more carefully examined. The diphtheritic pseudo-membrane was found on both tonsils, at the same time that there was a distinct scarlatinous rash, and, as additional proof of the coexistence of the two diseases, the father became affected with diphtheria without scarlatina.

An occasional result of severe pharyngitis in scarlet fever is suppuration, or gangrene occurring in the subcutaneous cellular tissue of the neck. Whether suppuration occur, and an abscess form, or gangrene result, this complication is often serious. Suppuration or gangrene indicates an intense grade of inflammation or a low vitality; but many with this complication recover through protracted convalescence.

If suppuration is extensive, it may so increase the debility that death occurs in consequence. Gangrene is a more serious complication; unless slight, it renders a fatal termination highly probable. The areolar tissue, subcutaneous or intermuscular, is the part which primarily sloughs. The skin over the gangrene becomes brown or dark, and separates with the slough. In the majority of cases the slough is not large. Exceptionally it extends so deeply that, when it separates, the muscles and even vessels of the neck are laid bare, and the appearance is hideous. In a case of this sort, which I saw a few years since in the practice of another physician, the cavity, after the slough had separated, was irregular, and sufficiently large to admit a hen's egg. It extended a considerable distance out of sight under the skin, and finally opened a vessel from which fatal hemorrhage occurred.

Gangrene of the mouth also occurs in rare instances, either as a complication or sequel. I have met it in two cases, one of which recovered. In the fatal case it began while the patient was still under treatment for the fever, and was first discovered by the loss of two incisors. The one that recovered also lost two incisors, and a part of the superior maxillary bone. The one that died was scrofulous, though its regimen was good; the other lived in a tenement-house, and was ill cared for. Rilliet and Barthez relate three cases of gangrene of the mouth, occurring, however, not as a complication, but sequel, of scarlet fever. One of these patients had, within eighteen days, varioloid, scarlet fever, and measles; these diseases ending in fatal gangrene of the pharynx and mouth. The second child was taken, on the seventeenth day after the commencement of scarlet fever, with gangrene of the pharynx, succeeded by that of the mouth, and died on the twenty-fourth day. In the third case the gangrene was preceded by small-pox as well as scarlatina. Other observers have recorded similar cases.

Another complication, to which allusion has already been made, is entero-colitis. This may antedate the zymotic affection. In other cases, entero-colitis commences either with the scarlet fever, or during its course. Diarrhœa often occurs in connection with the vomiting, in the first hours of the fever; and it commonly ceases during the first or second day. Occasionally it continues with greater or less severity, when it constitutes a serious complication; it is in these cases due to intestinal inflammation. Bronchitis and pneumonia, so common in measles, do not often complicate scarlet fever.

A not infrequent complication is articular rheumatism, occurring when the fever begins to decline. Mild cases are more liable to it than those having a severe form. Attention is called to it by the complaint of the child of pain or tenderness in the affected joints; or, if he is too young to speak, by evidences of pain when the joints are pressed or moved. There are usually but little swelling and redness, and there are fewer joints affected than in most cases of acute primary rheumatism. In my practice, a common seat of scarlatinous rheumatism has been the areolar tissue of the wrist. The inflammation and infiltration are less than in primary acute rheumatism. This complication is not, ordinarily, serious; nor does it, as a rule, materially retard convalescence. A physician of this city, however, informs me of two cases in which cardiac inflammation occurred in connection with the articular affection, as it so frequently does in idiopathic rheumatism. The urates are not so commonly present in the urine in scarlatinous as in ordinary acute rheumatism.

Serous inflammation, especially that affecting the peritoneum, pleura, or pericardium, is a common complication, independently of the rheumatic affection. It occurs during the desquamative period, and, continuing afterwards, becomes a sequel. Many such cases are fatal. Pericarditis may be with difficulty diagnosticated, if it is slight, and attended by only a moderate amount of effusion, and it is, doubtless, often the cause of death in those who die suddenly and unexpectedly during or soon after an attack of scarlet fever. Pleuritis occurring in scarlet fever is apt to be suppurative. In 1865 I attended a little girl in a mild attack of the fever. When it had nearly ceased, and the case was about being discharged, she was taken with severe pleurisy of the right side. The pleural cavity was soon half filled with liquid, and after a long sickness, extending over two months, this liquid, mainly pus, established a communication with a bronchial tube, and was expectorated. She immediately recovered.

In the following case, the records of which are from my notebook, pericardial and peritoneal inflammation occurred as a complication of scarlet fever:—

CASE.—April 7th, 1860, C—, girl, five years and ten months old, had measles two years, and hooping-cough one year ago. With the exception of a slight cough, she has since remained well, till the present sickness. Scarlatina commenced April 4th, and on the 5th the eruption appeared. Symptoms severe, but regular; pulse 158, full; surface hot, and covered with the eruption; delirium at night; stomach irritable; constipation. April 8th to 10th, symptoms about the same; no delirium, however; pulse varying from 124 to 153 per minute; a deposit of urates in the urine.

11th. To-day, for the first, has severe pain in the epigastrium, accompanied by tenderness on pressure, and moderate distension at this point. The symptoms otherwise are favorable, though pretty severe; pulse 140; respiration moderately accelerated, but the rhythm natural; respiratory murmur distinctly heard in all parts of the chest, vesicular in character, and without râles. Has taken till to-day mainly diaphoretic mixtures; to-day pulv. ipecac. comp. gr. iij, every three or four hours, is ordered; a flaxseed poultice to be applied to the epigastrium; diet nutritious, with moderate use of stimulants.

12th. Epigastric pain still severe; great tenderness on pressure; considerable distension at this point, and percussion elicits a dull sound; passed a restless night; when asked where she feels pain, she points to the throat and epigastric region; pulse 130 to 140 per minute; rash fading; surface warm; bowels somewhat relaxed; urine passed in usual quantity. The treatment by Dover's powder and poultices is continued, and a leech is to-day applied to the epigastrium.

13th. Pain less severe, but considerable tenderness on pressure; pulse about the same as yesterday; has had through her sickness a slight cough. She talks rationally, and sits much of the time in bed.

14th. Continued in the same state as described in yesterday's records, till 3 P. M. yesterday, when she became suddenly worse; her respiration was short and gasping; she spoke, with an effort, in a whisper, but continued conscious; and her pulse was strong. Death occurred at 5 P. M., apparently from obstructed respiration. In the last days of her sickness there was but little pharyngitis, and little or no external swelling.

Autopsy twenty-four hours after death.—Body a little emaciated; heart large for a child of five years; about one ounce of turbid serum in the pericardium; a soft deposit of lymph within the pericardial sac at the base of the heart, around the origin of the great vessels evidence of recent circumscribed pericarditis; from four to eight ounces of transparent serum in each pleural cavity; no fibrin upon or opacity of the pleural surfaces; mucous membrane of bronchial tubes injected in streaks, and muco-pus can be pressed from them; both lungs can be readily inflated, with the exception of small portions of both the lower lobes, which are hepatized, and can be but partially inflated; liver enlarged, presenting a congested appearance, and extending some four inches below the free border of the ribs; upon its convex surface in the epigastrium, corresponding with the seat of the pain, is a white rough patch of fibrin about one and a half inches in diameter; kidneys congested; stomach and small intestines apparently healthy; mesenteric glands moderately enlarged; mucous membrane of transverse and descending colon somewhat injected and thickened, showing mild colitis; no ulceration noticed; brain not examined.

Microscopic examination was made of the blood, hepatized portions of lung, etc., but nothing of special interest in this connection was observed.

This case is instructive as showing the liability which exists in and after scarlet fever to inflammations, and the difficulty of diagnosticating them in certain cases on account of their circumscribed character.

SEQUELÆ.—The complications described above *may* occur as sequelæ, but there is another pathological state which may be a complication, and is a common and serious sequel. I refer to nephritis with albuminuria. This occasionally commences in scarlet fever, but usually not till the disappearance of the rash. There is sometimes, during the course of scarlet fever, and even subsequently, slight albuminuria due to simple congestion of the kidneys, but the albuminuria to which I allude, and which requires treatment, is more serious. Its anatomical character is as follows: hyperæmia, and perceptible increase in volume of the kidneys; proliferation of the renal epithelial cells like that of the epidermis, and a granular deposit in them; the escape of albumen from the engorged capillaries, and its appearance in the urine; the formation of fibrinous casts in the tubuli uriniferi, these casts often containing more or fewer epithelial cells; the escape of the casts from the kidneys with the urine; diminution of amount of urea excreted, and, therefore, its accumulation in the blood; and finally rupture of thè engorged capillaries of the kidneys, and mingling of the elements of the blood with the urine.

The presence, therefore, of this renal affection can be readily ascertained by examining the urine. The quantity of albumen which this liquid contains can be approximatively ascertained by adding nitric acid or applying heat. If the quantity is small, simple cloudiness is produced; if large, the urine becomes thick and white, and in extreme cases almost semi-solid from coagulation of the albumen. The character of the urine can, however, be more accurately ascertained by the microscope than by the tests which have been mentioned, since by it we discover the fibrinous casts, altered epithelial cells, and blood corpuscles.

Nephritis, with the consequent uræmia, soon gives rise to evident symptoms. Serous effusion takes place in consequence of the altered state of the blood, the most common form of which is anasarca, occurring upon the face and limbs, and sometimes in the areolar tissue of the trunk. Often the effusion occurs only in the external areolar tissue, and the result is then favorable; but in other cases it occurs, and in the order mentioned as regards frequency, in the lungs (œdema pulmonum), serous cavities, and, lastly, in the submucous connective tissue of the larynx (œdema glottidis). The internal effusion should excite the gravest apprehensions, as it is often fatal. Fortunately, it is in most cases preceded as well as accompanied by anasarca, which is easily detected, so that there is sufficient forewarning. The fact of an occasional exception to this rule should be borne in mind.

Scarlatinous nephritis, with consequent uræmia, is due to the direct effect of the scarlatinous poison on the kidneys. I have known it occur in the nurse who attended a child through the fever, but did not suffer from the fever herself. It sometimes occurs quite abruptly, and often when the patient has been progressively convalescing, and, perhaps, has seemed out of danger. In most cases, however, there are well-marked premonitory symptoms, as fever, restlessness, loss of appetite. The anasarca is first observed in the face or about the ankles. Sometimes it remains inconsiderable, but in other cases it increases day by day, more or less rapidly, till the appearance of the patient is much altered. In marked cases of anasarca the features are so bloated that their natural expression is lost. The volume of the trunk and legs is augmented, and, more slowly, that of the arms. In the male child the penis and scrotum frequently attain three or four times their normal dimensions, in consequence of serous infiltration.

The duration of the anasarca or dropsy is very different in different cases. If the form be œdema pulmonum, œdema glottidis, or intra-cranial effusion, death is speedy. It may occur even within a day. Hydrothorax and hydropericardium are also ordinarily fatal, though not so speedily; while in ascites the prognosis is much more favorable. The duration of anasarca under the most favorable circumstances, unless it is very slight, is commonly not less than two or three weeks, and is often much longer. There is another and an important source of danger apart from the serous effusions, namely, the retention of urea in the blood. Convulsions, coma, and death may occur from uræmic poisoning, as in Bright's disease. In those cases there is great and continued scantiness of urine, in consequence of obstruction in the tubuli uriniferi from fibrinous casts and granular and swollen epithelial cells.

The liability to this renal affection is greatly increased, and in some cases is mainly attributable to the close relationship, as regards their functions, which exists between the skin and kidneys. A common exciting cause is exposure to vicissitudes of temperature or currents of air, by which the surface is chilled, and cutaneous transpiration checked, at the time when the old epidermis is being detached. The increased burden thrown upon the kidneys results in the pathological state which has been described. This remark does not conflict with the statement already made, that the nephritis is due to the direct effect of the scarlatinous principle on the kidneys, the disturbance of the function of the skin merely increasing the functional activity of these organs and rendering them more susceptible to the disease. All who have seen much of scarlet fever can recall to mind cases in which the patients had nearly recovered, when from some needless exposure in the streets, or by chilling of the body in a cold room, or open window, this affection occurred, with perhaps a fatal result. Elsewhere I have alluded to a case in which scarlet fever was only detected by this sequel, which began when the child was daily exposed in the open air. But many children who have been attended with the utmost care, and who, through the whole desquamative period, are kept in a uniform temperature, nevertheless become affected with albuminuria and dropsy, so that there is sufficient cause of this sequel in the state of the child and the nature of the disease through which he has passed, apart from extraneous influences. It is an interesting fact that albuminuria is more apt to occur after mild than severe cases of scarlet fever, and observations show that this difference in liability to albuminuria is intrinsic; in other words, that it does not depend, as some have supposed, on a difference in the hygienic management of mild and severe scarlatina.

The *symptoms* in scarlatinous nephritis vary not only according to the degree of the inflammation, but also according to the amount and seat of the effusion. I have stated that it usually commences with languor and more or less fever. The pulse remains accelerated, the skin is hot and dry, and the appetite poor. This affection, if slight, may occur without appreciable effusion, either in the cellular tissue or the cavities, but ordinarily in these mild cases a little puffiness is observed around the eyes or upon the extremities. In the majority of cases more extensive anasarca results. The skin is then pallid, distended, and pitting on pressure. The anasarca does not, in most instances, give rise to any marked symptoms. If œdema glottidis or pulmonum occur, the respiration becomes rapidly more embarrassed, till soon the blood is no longer sufficiently oxygenated for the purposes of life. The chief symptom in hydrothorax is accelerated and difficult respiration; in hydropericardium the symptoms are such as arise from embarrassed action of the heart; in ascites there are either no marked symptoms, or, if the amount of liquid is large, there may be more or less embarrassment of respiration from compression of the lungs.

Otorrhœa.—Inflammation of the external ear, giving rise to otorrhœa, is a frequent sequel of scarlet fever. It sometimes commences as a complication in the last stages of the fever; at other times it begins during convalescence. It often produces a degree of deafness, which, in most instances, soon passes off. A thin, purulent discharge from the ear may remain for months or even years, and hence the name which designates this affection. In exceptional cases, internal otitis occurs. This is a more serious sequel; it may impair the hearing permanently. There are cases in which not only the drum of the ear is destroyed, but the ossicles are detached, and lost through the external ear. Complete deafness then results. I have met one case, in which both ears were so injured by scarlet fever in infancy, that the child grew up a mute. The result is sometimes still more serious. The inflammation may extend inwards, causing caries of the petrous portion of the temporal bone, till it reaches the lateral or petrosal sinuses. The inflammation then causes thickening and bulging of the walls of the sinuses, and, consequently, partial obstruction to the circulation, congestion in the veins and sinuses, the formation of thrombi, and finally coma and death. Fortunately, this melancholy termination of scarlatinous otitis is not frequent.

ANATOMICAL CHARACTERS.—There is some difficulty in determining what are the anatomical characters of scarlet fever, since so many who die of this disease have a complication, and the lesions of this are superadded to those of the fever. The following, however, are the facts which have been ascertained in reference to this point. In many the brain, its membranes, and the lungs are congested; often, also, the Peyerian, solitary, and mesenteric glands are enlarged, and the spleen enlarged and softened. The liver and kidneys do not present any notable alteration, though the latter are so often affected during the period of convalescence. Dr. Samuel Fenwick (*London Lancet*, July 23, 1864) has made post-mortem examinations in sixteen cases of scarlet fever, and concludes from them that there is inflammation of the mucous membrane of the stomach and intestines like that of the skin, and that there is desquamation of the epithelial cells from those portions of the digestive tube like that of the epidermis. I have had opportunity of examining the stomach and intestines in those who died in the eruptive stage during epidemics, in the Nursery and Child's Hospital, and have never found any unusual hyperæmia of the gastro-intestinal surface, unless when gastro-intestinal inflammation had occurred as a complication. In malignant cases the blood is dark, and the heart-clots soft and small; in other cases the color of the blood may be nearly normal, and the heart-clots of the usual size and firmness.

NATURE.—Scarlet fever presents in a marked degree the distinguishing features of the contagious affections. It is highly infectious; it is also inoculable. Stoll, d'Amboise, and others successfully inoculated with the scarlatinous virus, using the blood, but without diminishing the intensity of the disease. Whether scarlatina ever originates spontaneously is uncertain; but if it do, such cases are rare. It ordinarily spreads through a community by infection, though the distance to which it is infectious is short, probably not more than two or three yards. Some consider the distance to be even less than one yard. Knowledge of this fact is important, as by isolating in a family a child attacked by scarlet fever, and allowing no communication with the nurse, the other children often escape. A very common mode of communication is by clothing, so that a third person is the medium of transmission. I have noticed that when scarlet fever, as well as measles, is epidemic in this city, a large proportion of the cases, nearly all, indeed, of the first cases, can be traced to the public schools. Exposure occurs through those children who come from apartments where cases are under treatment. Physicians, and especially nurses, are sometimes the medium of communication. A medical friend of mine went directly from some children with scarlet fever, whom he was attending, to another family, where he took a little girl upon his knee. This girl in a few days became affected with scarlet fever and died. The two remaining children in the family were then attacked, and one died. Murchison alludes to similar cases (*London Lancet*, August 13, 1864). In one instance in my practice scarlet fever was communicated to an infant by a washer-woman whose own child had the disease, and who, on reaching the house where she had been engaged to work, threw her shawl over the cradle where the infant was sleeping. Six days later the infant was attacked. Mason Good cites a case where a box of toys was the medium of communication; and it is said that also a letter has been. The scarlatinous virus may remain for weeks and even months in apartments, clothing, or in or upon the person of one who has been affected, without any appreciable diminution in its effectiveness. A physician of this city, in whose family scarlet fever occurred, excluded a child from the room occupied by the patients, and from the patients themselves, for a month after the last case occurred, and yet, although precautions had been taken in reference to clothes and bedding, this child was taken with scarlet fever soon after it was allowed to mingle with the other children. The father believes that the exposure was through the otorrhœa of one of the children. Observations, indeed, appear fully to establish the fact that the discharge from the ear or nostrils, and the particles of epidermis which have exfoliated, may retain the virus and be the medium of communicating the disease several weeks after the fever has terminated. In a case in my practice a little girl returned home six weeks after her brother had scarlet fever, and, within a few days, took the disease. A more striking example occurred in the practice of Dr. J Kearn~~e~~y Rodgers, formerly a prominent and much esteemed surgeon of this city, and was related to me by an intelligent friend of the family since the doctor's death. Six children in a family had scarlet fever. Three and a half months subsequently another child, living at a distance, was allowed to visit them in the apartments where they had been sick. One week from that day this child became affected with the disease. Dr. Elliotson states that a patient with scarlet fever was admitted into one of the wards of St. Thomas's hospital, and, for two years subsequently, young persons who were admitted into this ward were apt to take the disease. Dr. Richardson relates the case of a family of four children, residing in the country. One died of malignant scarlet fever, and the rest, who had been removed, escaped. Some weeks subsequently one of the children returned, but within twenty-four hours took the disorder and died. The cottage was now thoroughly cleaned, whitewashed, and the clothing destroyed. Four months then elapsed, when the third child returned home, who also took scarlet fever in a malignant form and died. It was believed that the virus remained attached to the thatch, which extended close to the children's bed. Other similar examples might be mentioned, sufficient to establish the fact of the great permanence of the scarlatinous virus.

The period of incubation in scarlet fever varies. It is seen in the remarkable example of contagion, given above, that it was only twenty-four hours. Trousseau also relates an interesting example of short incubation. "An English gentleman with his daughter was returning from Pau to London, and was joined at Paris by another daughter, who came direct from London. Scarlet fever was prevalent in London, but there was not a case of it at Pau. The second daughter was seized with scarlet fever in crossing the channel, and joined her relatives in Paris seven or eight hours later. She occupied the same room in the hotel as her sister, who was also attacked within twenty-four hours." The incubative period is, however, seldom so short. It is usually from three to eight days. I might cite several cases in which this was its duration. Some writers allude to cases in which two, three, or even four weeks elapsed from the time of exposure to the appearance of the disease. It is, however, a question whether in such cases there may not have been a second and more recent exposure. Rostan alludes to cases in which scarlet fever was communicated by inoculation, and in which the period of incubation was seven days.

Scarlet fever occurs most frequently between the ages of three and ten years. It is infrequent under the age of one year, and infants under the age of three months may be considered safe from an attack of it, though fully exposed. Cases have been reported of scarlet fever occurring in the fœtus, and manifesting itself by the usual signs at birth. But a clear diagnosis in such instances is necessarily difficult, on account of the character of the scarlatinous eruption on the one hand, and the nature of the cutaneous circulation in the newly-born on the other. It is probable that, in the cases alluded to, there was an error of diagnosis. Certainly in two instances I have known women immediately after their confinement (within a week) take scarlet fever, and although they communicated the disease to others, did not to their infants. Murchison states that twice he has known women with scarlet fever to be confined, and in both instances the infants were healthy.

Most adults possess immunity from scarlet fever, although not protected by an attack of it in childhood. Parturient women, however, are liable to it, and there is considerable danger that the physicians who attend them, if at the same time visiting cases of scarlet fever, may communicate the disease to them.

Scarlet fever is sometimes sporadic, but, as we meet it in this country, it occurs most frequently as an epidemic. The epidemics vary greatly in type. Some are mild, and attended by few complications, so that the result of treatment is eminently satisfactory. In other epidemics the type is malignant, the complications frequent, and the percentage of deaths large. There is sometimes a succession of epidemics of one type, and then the character of the disease changes. This fact of a variable type is important as regards the value of statistics relating to treatment. Each epidemic has its prevailing character, but when the form is mild, there is now and then a case of severity, and when it is malignant, now and then one of unusual mildness. The epidemic influence is sometimes manifested in those exposed to scarlet fever by the occurrence of pharyngitis, and, as we have seen, nephritis. Professor George B. Wood, of Philadelphia, says (*Treatise on the Practice of Med.*): "I seldom attend cases of scarlet fever without having sore throat."

Scarlatina usually occurs but once in the same individual, but a second attack after the lapse of several years is not uncommon, and there are even cases on record of a third attack. But physicians sometimes mistake roseola or erythema for scarlet fever, and, though afterwards aware of their mistake, do not correct their diagnosis. Hence there is a belief in the community that second attacks of scarlet fever are more frequent than they really are.

DIAGNOSIS.—In the commencement of scarlet fever, prior to the eruption, there are no symptoms or appearances which will enable us to make a positive diagnosis. Positive statement in reference to the nature of the disease might better be deferred, for the credit of the physician. Still, if a child with regular bowels, and no appreciable local disease, a few days after exposure to scarlet fever, is suddenly seized with intense fever, the pulse rising to 110, 120, or more, and the temperature to 102°, 103°, or 105°, there is little doubt that the disease is scarlet fever. The diagnosis is rendered more certain if there is vomiting, and especially if, as is often the case, there is, at this early period, a blush of redness upon the fauces.

When the eruption has appeared, the nature of the affection is, in most cases, apparent. Still, roseola or erythema, due to intestinal derangement or other causes, has often, as already stated, been mistaken for scarlet fever. A day or two suffices to show the error. In scarlet fever there is more inflammation of the faucial and buccal surface, more continuous and persistent redness of the skin, and greater intensity and persistence of symptoms, than in those diseases. Scarlet fever is also further distinguished from them by the papular elevations upon the tongue, and the minute papulæ upon the skin. Besides, in scarlet fever, except in the mildest cases, there is from the first the aspect of serious sickness, which roseola and erythema do not present.

Scarlet fever and measles were long considered identical by the profession, and, though the ordinary forms of the two diseases can be readily distinguished from each other, there are instances in which the differential diagnosis is attended by some difficulty. Measles occurring in a robust child, with an active cutaneous circulation, sometimes presents a continuous eruption over a considerable part of the surface, like the eruption of scarlet fever. But the longer period of invasion, the coryza and bronchitis, and the absence or slight degree of pharyngitis, in connection with other symptoms, enable us to distinguish these cases from scarlatina. Moreover, in those cases of measles in which there is continuous redness of surface where the circulation is most active, as upon the face, the characteristic rubeolous eruption is present in other parts, so that, with care in examination, error of diagnosis may be avoided. Scarlet fever and measles may indeed occur together, but such a complication is rare.

The greatest difficulty of diagnosis occurs in abnormal scarlatina, especially when the rash is partial and indistinct. There is apt to be, in this form of the disease, an inflammatory complication, which causes withdrawal of blood from the surface, and it is sometimes very puzzling to decide whether this is a complication, or the sole disease. The points involved in diagnosis are numerous, but they are sometimes not sufficient to show the character of the affection. Generally, however, by observing the clinical history from day to day, the diagnosis is established. In cases of doubt it is safest to adopt such hygienic management as is appropriate to scarlet fever.

PROGNOSIS.—The prognosis depends on the form of the disease, whether mild or severe, the presence or absence of complications, and the strength of the patient. The mortality varies greatly in different epidemics. In epidemics of a mild type, the mortality is sometimes not more than one in twelve, and the ratio may be less; whereas, if a severe form is prevailing, not more than one recovers in every two, three, or four. The mortality is greater in the city than country, in hospital than in private practice. Rilliet and Barthez, in hospital practice, lost forty-six out of eighty-seven. Scarlatina is, of itself, less fatal than statistics would lead us to suppose, since a large proportion of those who die in consequence of it die from complications or from sequelæ, rather than from the primary disease.

The symptoms, in the first days of scarlet fever, which indicate an unfavorable termination, are convulsions, except at the very commencement, great drowsiness, with jactitation, great elevation of temperature, a rapid pulse, duskiness of the eruption, and feeble capillary circulation. At a later period, particularly in the second week, other unfavorable symptoms may occur in malignant and fatal cases. Violent pharyngeal inflammation, with great external swelling from the adenitis and cellulitis, is apt to be present at this stage of the disease. Severe inflammation of this character, as indicated by the tumefaction, greatly increases the danger.

As there are several complications and sequelæ of a dangerous character, and as these are apt to occur suddenly, and often without appreciable existing cause, in mild as well as severe cases, it is unwise ever to make an unconditional favorable prognosis. The patient is not to be considered entirely safe till two or three weeks have elapsed after the eruption.

Some patients who have passed through scarlet fever, die of asthenia, in consequence of the anæmic state which the fever has produced. They have not sufficient vigor of system to recover, although no serious complication or sequel has occurred. In other cases the pharyngitis and cellulitis, attended with tumefaction, rendering deglutition painful, and keeping up the febrile movement after the primary disease has run its course, have much to do in producing a state of exhaustion and death. But the mortality in the desquamative stage, and subsequently, is more frequently due to the renal affection, which is so common, than to any other cause. This affection gives rise to dropsies, which are fatal, or to uræmic convulsions, and coma. Sudden and unexpected deaths are not uncommon in scarlet fever, and it is probable that, in many of these cases, the immediate cause is uræmia, which, not having produced any conspicuous symptoms till near the close of life, is not discovered.

TREATMENT.—Scarlet fever, when mild, and without complication, requires little treatment. A gentle cathartic, like the citrate of magnesia, should be given from time to time, if there is a tendency to constipation, and a simple diaphoretic mixture in addition, is all that the case requires.

℞. Spts. æther. nitr.,
Syr. ipecac., āā ʒij;
Syr. simplic. ℥j. Misce.
Dose, one teaspoonful every three hours to a child of three to five years.

If there is restlessness, an occasional warm mustard foot-bath will give relief; and if there is considerable fever, as indicated by flushed face, heat of head, cephalalgia, or other nervous symptoms, cool applications should be made to the head, and the face and forehead occasionally bathed with cool water, bay rum, or other cooling lotion. The mildest cases indeed commonly do well without treatment, except hygienic, though it may be necessary, in consequence of the impatience of the family, to prescribe a placebo. When the fever has begun to abate, in such cases, if the appetite returns, and there is no complication, and no symptom of feebleness, there is little for the physician to do. But if, as is sometimes the case, even when the disease has been mild, the appetite remains poor, and the aspect is anæmic, tonics are required, especially chalybeates.

The majority of cases, however, demand more decided measures than those described above. We pass to the consideration of cases of moderate severity, and those of a grave character. Trousseau recommends cold affusions as an important part of the treatment. They should be employed in the first stages of sthenic cases. They are especially beneficial, it is stated, in those cases in which nervous symptoms predominate. The patient is placed naked in a bathing-tub, and three or four pails of water are thrown over him, in a space of time varying from a quarter of a minute to one minute, after which he is covered with bedclothes, without being wiped. Reaction immediately occurs, often with more or less perspiration. This treatment is repeated once or twice daily, according to the gravity of the symptoms.

"Dr. Currie," says Trousseau, "was the first who made use of this treatment, and he established its applicability, as a general rule, in scarlatina accompanied by grave nervous accidents, such as delirium, convulsions, diarrhœa, excessive vomiting, considerable exaltation of the heat of surface." Trousseau believes that cold affusions diminish the febrile movement, and calm the nervous excitement, and he further adds: "* * I have never administered it without deriving some benefit." Public opinion is, however, so averse to such treatment of the eruptive fevers, that one of less authority than Trousseau would scarcely be able to employ it. The shock of such treatment to a child not sufficiently old to be reasoned with must be considerable, and it would seem questionable whether the excitement from such a measure may not increase the liability to clonic convulsions.

In the cases alluded to by Trousseau, in which there is great heat of surface, and nervous symptoms predominate, though cold affusions are not used, there is no doubt of the beneficial effect of cold applications to the head, and sponging the face and arms. This may be frequently repeated if there is great elevation of temperature.

The medicinal treatment of scarlet fever has varied greatly at different periods, according to the theory which happened to prevail, and it is even now far from uniform. Physicians, however, generally prescribe sustaining measures. If catalysis occur, as the fundamental pathological process, in scarlet fever, and the other so-called zymotic diseases, and if we possess safe anti-catylitic medicines, which will arrest this process, these agents are in all cases required. But the use of anti-catylitics is still experimental, and they are not, therefore, to be recommended in place of remedies which have been long employed, and are known to be of real value.

Depletion is rarely required in scarlet fever; on the other hand, sustaining measures are indicated from the first. Bloodletting, formerly more or less employed in the treatment of this disease, is now almost obsolete. In no instance is venesection required. In rare instances, in robust children, having an active circulation and a decidedly sthenic form of the disease, there might be a condition in which one or two leeches would be serviceable; as, for example, leeches applied to the temple, if there is evidence of dangerous cerebral congestion. But in these cases a sufficiently sedative or tranquillizing effect can, ordinarily, be produced by the application of cold to the head, cold ablutions to the face and hands, and by an occasional warm general or foot bath. In all malignant cases, measures which reduce the vital powers cannot fail to be injurious. In those cases which are properly designated by that name, there are often evidences of prostration from the first, as drowsiness, jactitation, delirium, languid circulation, evinced by the dusky hue of the surface. These symptoms indicate the need of stimulants.

In the ordinary as well as severe forms of scarlet fever, carbonate of ammonia, administered with a tonic, is one of the best remedies. It is, moreover, recommended by the best authorities. It may be prescribed at the first visit of the physician, and continued at regular intervals. It is used as a main remedy by many judicious and skilful practitioners. I ordinarily prescribe it in combination with citrate of iron and ammonia.

℞. Ammon. carbonat.,
Ferri et ammon. citrat., āā ʒss;
Syr. simplic. ℥ij. Misce.

Dose, one teaspoonful every three hours to a child of five years.

The preparations of cinchona are also useful tonics. The reader is referred to our remarks on the use of carbolic acid, under the head of Pròphylaxis. It promises to be not only a prophylactic, but remedial agent of great value in scarlet fever.

An unpleasant symptom in most cases, and one which increases greatly the restlessness of the patient, is itching of the skin. The safest and best remedy for this is inunction. Fresh lard has sometimes been employed for this purpose. It relieves the dryness, and in a measure the heat of surface, and at the same time diminishes the itching. The odor from the lard is, however, offensive after it has been used for a day or two. An equally efficacious, more agreeable, but more costly substance for the inunction is glycerine, which may be applied pure, or scented with one of the essential oils. Dr. J. F. Meigs recommends the following:—

℞. Glycerinæ ʒj;
Ung. aq. rosæ ℥j. Misce.

I prefer to either of these applications the employment of sweet oil or glycerine, to each ounce of which about six or eight drops of carbolic acid are added.

The inunction should be made with the palm of the hand, or with muslin or linen. Those parts of the surface which are the seat of itching should be frequently treated in this way, and occasionally the application may be made over the entire surface. Not only does inunction have the local effect which has been described, but it is stated to diminish sensibly the rapidity of the pulse and the general temperature of the body.

The cases which require the closest watching and the most judicious management are those of an ataxic character. These cases are characterized by nervous symptoms, as jactitation, drowsiness, delirium. There is great heat of surface, while the capillary circulation is sluggish. Sometimes the rash is indistinct. In such cases a general warm bath is useful, to which mustard is added in sufficient quantity to cause some irritation of the surface. This not only quickens the capillary circulation, producing a better color of the rash, or causing it to appear, if its development is retarded, but it calms the nervous excitement, and is often instrumental in preventing convulsions. If convulsions occur, which are attended by disappearance of the eruption, the bath should be employed at once. In grave cases, in which the rash is indistinct, some physicians, whose opinions are entitled to consideration, employ belladonna in sufficient dose to cause an eruption. I am not aware, however, that the severity of scarlet fever is diminished by this agent, as thus employed, although the disease is apparently rendered more normal by its use, so far as the rash is concerned.

The pharyngitis demands attention in most patients. Various modes of treating this have been recommended. The application of leeches to the throat, once a common practice in severe scarlatinous pharyngitis, has fortunately fallen into disuse. If the pharyngitis might be diminished by leeching, which is doubtful for this form of inflammation, the benefit is more than counterbalanced by the evil effect, as regards loss of strength, which results from depletion. The application to the throat of a cloth wrung out of cold water, or containing pounded ice, has been recommended; but the continued wetting of the patient which such treatment necessitates, and the danger from constant cold applications of chilling the body and causing retrocession of the eruption, would deter the prudent practitioner from employing such measures.

After making use of various applications, I have been led to regard with most favor the use of a slice of salt pork, cut as thin as possible, and stitched to a single thickness of muslin or linen. The pork should pass from ear to ear, the cloth being tied or pinned over the vertex. It is best to sprinkle salt, or salt and pulverized camphor, upon the pork, in order to secure a more prompt effect. If the application is properly made, the surface usually begins to be reddened in twenty-four hours, and, by the second day, an impetiginous eruption appears upon the part covered by the pork. Counter-irritation gradually produced in this manner causes little suffering. Patients, ordinarily, do not complain of it at all. This application should be continued through the fever, being occasionally left off for a day or two, as too much soreness is produced, and a linen cloth smeared with sweet oil or some simple ointment applied in its place.

This simple external treatment diminishes the inflammation of the mucous membrane underneath, and also to a certain extent that of the connective tissue, in those severe cases complicated with cervical, cellulitis so that tumefaction and suppuration about the angle of the jaw are less likely to occur. A well-known physician of this city, who has had ample experience in the treatment of children's diseases, ordinarily applies a small blister over the most prominent part of the swelling at the earliest moment, and by the vesication believes that he often succeeds in materially diminishing the inflammation. But counter-irritation in the manner which I have advised has the advantage of being less painful while it is equally effectual, and the irritated surface heals readily. I have never known the eruption produced by pork assume a gangrenous, phagedenic, or otherwise unhealthy appearance. This treatment does not always prevent a considerable degree of inflammation and tumefaction, but, if properly employed, it does diminish more or less this local affection. If there is external swelling which counter-irritation does not remove, and it becomes red and painful, irritating applications are no longer proper. Emollient poultices are now required.

Mild cases of scarlet fever do not require direct applications to the inflamed faucial surface. Gargles of a saturated solution of chlorate of potash, to which one of the astringent preparations of iron is added, or, better, carbolic acid in the proportion of about six drops to the ounce, should be employed by those old enough to use them, in cases of moderate or severe pharyngitis. In younger children, and in all cases in which the pharyngeal symptoms are urgent, we cannot rely on gargles, but must make direct applications to the throat with a probang or a large camel's-hair pencil. I advise, in such cases, the application every three or four hours of the carbolic acid and chlorate of potassa, directing, also, the nostrils to be syringed with the same three or four times daily:—

℞. Acid. carbolic. ʒss;
Potas. chlorat. ʒiij;
Glycerinæ ℥ij;
Aquæ ℥iv. Misce.
For the throat.

The effect of carbolic acid in checking the muco-purulent discharge and relieving the inflammation is often very decided. Occasionally, in severe cases, I apply once or twice daily in addition—

℞. Liq. ferri subsulphat. ʒj;
Glycerinæ ʒiij. Misce.

There is no application more effectual than this in removing any pseudo-membrane, and by its powerful astringent effect diminishing the turgescence of the inflamed surface. Yeast is also useful in many of these cases, given in the quantity of half a teaspoonful to a teaspoonful several times daily. As it is swallowed it touches each part of the throat, and, if no drink is allowed for a few minutes afterwards, it produces a healthy, stimulating effect on the diseased surface.

Sometimes, in feeble children, viscid mucus collects in the pharynx and around the aperture of the glottis, so as to interfere with inspiration. In these cases there is danger of death from apnœa. Prompt interference is required. Swabbing the throat removes the mucus, which is attached to the swab, or is expectorated by the forced cough which the operation causes. The swabbing may be performed by a piece of whalebone, bent at the end and wound with linen or soft muslin. I usually employ it dipped in the solution of carbolic acid and chlorate of potash. I have sometimes relieved the most urgent dyspnœa by this means. An accumulation of mucus in the pharynx or larynx, so as to require mechanical interference, is most frequent in infants.

The diet in scarlatina should be nutritious, consisting of animal broths, milk porridge, and the like. The patient will rarely take solid food, except in the mildest cases. Those affected with grave forms of the disease require nutriment as regularly, night and day, as in typhus and typhoid fevers.

In mild cases, alcoholic stimulants are not required, unless in moderate quantity towards the close of the disease. In severe cases, attended from the first with great prostration, they are needed throughout the entire course of the fever. Wine-whey or milk-punch should be regularly administered, in quantity according to the age of the child. The presence of severe nervous symptoms, as jactitation or delirium, in these asthenic cases, should not deter from its employment. Convulsions and coma are, indeed, less likely to occur if stimulants are used, since the scarlatinous virus is, in a measure, counteracted by such agents. The apartment in which the patient is treated should be airy, and ventilated without exposure to currents of air. The temperature of the room should be uniform, about 68° for robust children with high fever, about 70° for feeble children. It should be a little more elevated after the fever has abated, and the desquamative period commenced, than during the fever. The patient is, indeed, especially liable to be affected by changes of temperature, and currents of air, in the two or three weeks succeeding scarlet fever, and this exposure is very apt to result in inflammations, such as have been described. Therefore great care should be exercised in reference to the hygienic management of the patient during convalescence. In stormy weather he should be kept in-door for a month or six weeks.

The nephritic affection which is so common a sequel of scarlet fever is often more dangerous than the primary disease itself. A clear appreciation of its therapeutic indications is important, since by judicious treatment many recover whose lives would inevitably be sacrificed by improper measures. As there is in these cases active hyperæmia of the kidneys, having in most cases an inflammatory character, diuretics which stimulate these organs should not ordinarily be given, at least till this pathological state has, in a measure, abated. As the eliminative functions of the skin and of the intestinal mucous surface are to a considerable extent vicarious with that of the kidneys, diaphoretic and purgative remedies are required. By free diaphoresis, the ill effect of arrested or diminished renal secretion is, for a time, averted. Treatment to produce diaphoresis should vary somewhat in different cases. It should in most patients be commenced by the use of a warm general or foot bath, and the patient then be covered in bed. If free perspiration is not produced, it may be promoted by placing against the patient one or more bottles of hot water, surrounded by a wet cloth. The steam arising from this, and enveloping the body and limbs, produces a prompt sudorific effect. There is in use in this city, in the treatment of these and similar cases requiring diaphoresis, a convenient apparatus for generating steam. It consists of a cylinder pierced with holes for the admission of air, and containing a spirit-lamp over which is a pan or pail holding a little water. The patient, nearly denuded, is placed in a chair, with the apparatus by his side, and is covered with a blanket so that the steam surrounds the body. This gives rise to free perspiration, which continues after the patient is placed in bed. This treatment may be repeated each day, if the patient require it, while diaphoretics or cathartics are given.

The diaphoretics which are most serviceable in this affection are the acetates of ammonia and potassa, the bitartrate and citrate of potassa. Spiritus ætheris nitrici, combined with either of these, increases the effect, if the surface is warm, especially if there is already diaphoresis from the bath or steam. Spiritus Mindereri may be given to a child of five years, in doses of two teaspoonfuls every two or three hours, either alone, or in combination with sweet spirits of nitre, as in the following formula:—

℞. Spts. æther. nitrici ʒss ;
Liq. ammon. acetat. ℥iv. Misce.

The acetate of potash is a more agreeable medicine, and it is generally quite as effectual. It should be given, dissolved in water or syrup, in doses of about one grain for each year of the child's age. Whatever diaphoretic is used, has more effect, as has already been stated, if given in connection with the external measures designed to produce diaphoresis, which have been described above. If perspiration is not produced, the action of the medicine is probably on the kidneys; and if diuresis do not result, there is danger that the hyperæmia of the kidneys will be increased. In such cases diaphoretics should be omitted, and cathartic medicines given in place; or, if there is much exhaustion, it is sometimes better to give no eliminative medicine, and to treat the renal affection mainly by local and external measures.

In robust children suffering from scarlatinous uræmia and serous effusions, no medicines afford so much relief in the commencement as cathartics of a hydragogue nature. A mixture of jalap and cream of tartar, pulvis jalapæ compositus of the pharmacopœia, meets the indication. Even in children somewhat reduced, medicines of this nature are often required. Cathartics are more certain in their effects than either diaphoretics or diuretics, and therefore they should be given in urgent cases in which it is necessary to remove the urea or serum as speedily as possible. An excellent prescription in many of these cases, and one from which I have obtained a good result, is the following:—

℞. Podophyllin gr. j ;
Sacch. alb. ℈j. Misce.
Divid. in chart. no. viii–xii.
Dose, one powder, according to circumstances.

When cathartic or laxative agents have been used two or three days, the kidneys, being less congested in consequence of the diversion that has occurred, often begin to excrete more freely. Subsequently to the employment of medicines of this kind, or in connection with them, diaphoretics are in most cases required. The physician's experience, and his discrimination in reference to the condition of the patient, will guide him in the selection of proper remedies to meet the indications.

In a large proportion of cases, when this renal affection has continued one, two, or three weeks, the treatment which has been recommended above is no longer appropriate. There may be more or less anasarca and albuminuria, but the patient is anæmic, and evidently in need of sustaining measures, while there are no symptoms which indicate immediate danger from retention of urea or the excess of liquid in the system. In these cases the tincture of the chloride of iron is a most useful medicine. While it serves as a tonic, it seems also to have a diuretic effect. To a child of five years it should be given in doses of five drops, every three or four hours.

If the patient is decidedly anæmic and feeble when the renal affection commences, and the symptoms are not urgent, it is best not to administer diaphoretics and cathartics, or to administer them sparingly, and to commence early with sustaining remedies. Cases like the following from my note-book are not infrequent. A little boy, pale and scrofulous, began to have anasarca, after scarlet fever, chiefly of the scrotum, and accompanied by a moderate degree of ascites. The urine, which was passed in nearly the normal quantity, contained albumen. This patient gradually and fully recovered, with no treatment except the use of an oil-silk jacket over the kidneys and abdomen, to promote diaphoresis, and the use of iron. Such a case actively treated by eliminatives would, probably, have proved fatal. Uniform treatment for scarlatinous nephritis is therefore injudicious; considerable variation in measures is demanded, according to the state of the patients.

The otorrhœa of scarlet fever should not be neglected. It is apt to continue for months unless treated, and the hearing may become permanently impaired. There is danger, indeed, that the inflammation may extend inwards, with a most disastrous result. For this ailment there is, in my opinion, no remedy so useful as the following, which should be either dropped or syringed into the ear three times daily:—

℞. Acid. carbolic. ʒss–j ;
Glycerinæ ℥ij ;
Aquæ ℥iv. Misce.

It is also very beneficial when the otorrhœa occurs from scrofula or other cause. When the remedial agents required for the fever are discontinued, and the otorrhœa persists, cod-liver oil and the syrup of the iodide of iron, given in appropriate doses, will often be found useful, not only for the general health, but the otorrhœa. (See *Lond. Lancet*, Dec. 3, 1870.)

It is evident, from what has been said, that every possible precaution should be taken to prevent the patient's catching cold during the period of convalescence. He should not be allowed to go in the open air in unpropitious weather till a month after the fever. An oil-silk protection of the body, worn from the time that the febrile symptoms begin to decline, and covering the lumbar region, diminishes, in my opinion, the liability to nephritis and uræmia.

PROPHYLAXIS.—Since the period of Jenner's discovery of the prophylactic power of vaccination, as regards smallpox, the attention of the profession has been frequently directed to the prevention of scarlet fever. A medicine has been sought which would antagonize and mollify, if not entirely prevent, the disease. Of late years it has been claimed that belladonna, given during the period of exposure, and subsequently, is a preventive. The first employment of this agent for such a purpose was based entirely on theoretical grounds, it being presumed that, as it produces an eruption of the skin and dryness of the throat, like those of scarlet fever, it is therefore antidotal. Whether or not belladonna does have such an effect can only be determined by experience, and latterly, as observations accumulate, the number does not seem to increase of those who believe in its prophylactic power. Still, there is difference of opinion among good observers. The difficulty of determining positively the matter of prophylaxis is apparent when we consider that many children who are exposed to scarlet fever do not take it, although nothing is done for the purpose of prevention. Burnett made use of the following prescription as a preventive:—

℞. Ext. bellad. gr. j ;
Aq. canellæ ʒij. Misce.

Two or three drops were given morning and evening to a child of one year, and one drop more for every year for children of a more advanced age. He administered it to 120 infants, of whom only five contracted the disease. Schenck, half a century since, stated that, in the course of an epidemic, out of 525 persons who took belladonna only three contracted the disease. M. Biett, whose observations were made during the epidemic prevalence of scarlet fever in Switzerland, states that those to whom belladonna was given usually escaped. On the other hand, Lehmann and Wagner may be mentioned among others on the continent, who believe that they have derived no benefit from the use of this medicine. These physicians have seen one-fourth to one-third of those to whom belladonna had been given take scarlet fever. In this country, observers differ in their estimate of the preventive effect of belladonna. Dr. Irwin, of South Carolina, as quoted by Dr. Condie, gave it to 250 children, and less than half a dozen took the affection. He employed a solution of three grains of the extract in an ounce of cinnamon-water, giving two or three drops to a child under the age of one year, and one additional drop for each year. Dr. Condie himself, however, has had a different experience. He has prescribed belladonna, "but, although redness and dryness of the throat, and a diffuse scarlet efflorescence, were produced in the majority of cases, we never," says he, "found it in any to exert the slightest influence in mitigating the character or preventing the occurrence of scarlatina. The experiments were made during the prevalence of the disease, and in numerous instances the subjects of them were attacked. In one case the efflorescence was kept up by the use of belladonna forty-eight hours. In a week afterwards this individual took the disease in its most violent form, and died on the fourth day." My observations in reference to this use of belladonna are few, and they are not at all favorable to its employment. I have known scarlet fever occur, without apparently any modification, though belladonna was administered daily. Those who have made trial of this medicine have administered it in very different doses. Hahnemann employed it in so small a dose, that it would seem, *a priori*, that it could have had no effect. Hufeland employed the following formula:—

℞. Ext. bellad. gr. iij;
Alcohol ʒj;
Aq. destillat. ℥ss. Misce.

Dose, one drop morning and evening for each year of the child's age.

So small a dose would certainly do no harm, so that the medicine might be safely tried. Still, if belladonna is at all a prophylactic, it is reasonable to suppose that a larger dose would be more decidedly so.

The great importance of the prophylaxis of scarlet fever has induced me to state what is known of the effect of belladonna employed for this purpose. I am, however, strongly of opinion that by far the most reliable prophylactic, of which we have any knowledge, is carbolic acid. Our experience in New York city, in reference to the employment of this agent as a means of prevention, has not been sufficient to enable us to make a positive statement, but it has been largely employed by the New York physicians under the direction of the Health Board, in the apartments of those sick with infectious diseases, and the result, as regards at least scarlet fever, has been highly satisfactory. The Health Board employ largely carbolic acid, but other disinfectants in addition to it. (Appendix B.) The impure carbolic acid is preferable to the purified. Old rags soaked with it may be suspended in the room, or it may be sprinkled in the corners of the room, or placed on plates two or three times daily with water added. A positive statement in regard to the effect in a matter of such importance should be based on accurate and sufficient statistics, but it appears to me, from cases which I have observed, that the acid thus employed not only destroys in great part the infectiousness of scarlet fever, but also renders the disease milder in patients who constantly inhale its vapor during their sickness. I have been creditably informed that certain at least of the Sanitary Inspectors of the Health Board of New York, whose opportunities for observation are ample, entertain similar views. I take pleasure in referring the reader to the opinions in reference to the prevention of scarlatina of a British practitioner, of candor and great experience, who is favorably known to the profession on both continents. For a knowledge of the views of this gentleman I am indebted to Dr. Elisha Harris, the well-known sanitarian of this city. (Appendix B.)

CHAPTER III.

VARIOLA—VARIOLOID.

Variola, or smallpox, is a specific febrile affection, accompanied by a vesiculo-pustular eruption of the skin. Since the discovery of the protective power of vaccination, it has been shorn of much of its terror, but it is still the most loathsome and most dreaded of all the fevers. Two forms of this disease are recognized, depending on the fact whether there has been previous vaccination. If the patient has been vaccinated at some period in his life, the disease, which is rendered milder in consequence, is designated varioloid. If there has been no vaccination, it is called variola or smallpox. Both forms are identical in nature, the one communicating the other: they differ only in gravity.

Smallpox presents four stages: the initial, or that of invasion; the eruptive; that of desiccation; and, lastly, that of desquamation. It is called discrete when the pustules remain separated from each other; confluent when they unite. This division is made according to the character of the eruption upon the face and hands. There are parts of the surface, as the abdomen, where the pustules are always discrete, even in the confluent form.

Incubative Period.—During the last half of the last century inoculation with variolous matter was extensively practised in Great Britain and on the Continent, as it was found that smallpox thus communicated was milder than when received by infection. This operation enabled physicians to determine the period of incubation, which was found to be from eight to eleven days. When variola is communicated by infection, the incubative period is somewhat longer, namely, from twelve to fourteen days.

Stage of Invasion.—Smallpox begins abruptly with chilliness. In children of an advanced age, there is often, as in the adult, a distinct chill. This is followed by fever, and such symptoms as usually accompany febrile movement, namely, lassitude, anorexia, and thirst. There are, in addition, symptoms which, though not peculiar to smallpox, are so marked in the commencement of this disease, that they possess considerable diagnostic value. These symptoms pertain to the nervous system. There are in most cases of varioloid as well as variola, in the initial stage, severe frontal headache, pain in the small of the back, and great drowsiness, sometimes with delirium. In many children convulsions occur, preceded and followed by a degree of stupor which is almost as profound as coma. Trousseau suggests the name rachialgia for the pain in the back, as he believes that it is located in or around the spinal cord. This belief is based on the fact, which he, as well as other observers, has noticed, that there is sometimes in connection with this symptom an incomplete paraplegia, indicated by numbness of the legs, or even inability to use them, and sometimes more or less paralysis of the bladder. These paraplegic symptoms pass off in a few days. Vomiting is also a common symptom in this stage, and one also of diagnostic value. It occurs at short intervals for twenty-four to thirty-six hours. The same symptom is common in scarlet fever, and not infrequent in measles, but in both these affections irritability of stomach is much less persistent than in smallpox; vomiting does not occur in normal rubeolous and scarlatinous cases more than once or twice.

The tongue is covered with a moist fur. If the disease is to be discrete, constipation is commonly present in the stage of invasion; if confluent, diarrhœa is a common symptom, continuing till the fourth or fifth day, or even longer. Roseola or erythema sometimes occurs in this stage, and this may lead to error of diagnosis, the disease being mistaken for one of these cutaneous affections, or even for scarlet fever. The symptoms in the stage of invasion are usually more violent in confluent than in discrete variola, but there are exceptions.

Stage of Eruption.—The eruption commences about the third day, earlier in some cases, later in others. The average duration, therefore, of the first stage is somewhat shorter than in measles, but considerably longer than in scarlet fever. Sydenham has stated, and observations show the truth of the remark, that the shorter the first stage, the more severe the disease will prove to be; and, conversely, the longer the period, the milder will be its form. Therefore, if the eruption begins on the second day, it will, as a rule, be confluent; if not till the fifth or sixth day, it will be scanty, and the disease light.

The eruption commences [illegible]
those of lichen, which [illegible]
around the lips and upon [illegible]
part of chest, arms, and [illegible]

tion progresses, the symptoms, local and general, abate. The pulse and temperature, if the case is favorable, return to their normal standard. The cough, hoarseness, and thirst disappear, while the appetite returns; the sleep is more tranquil, and the functions, generally, are more regularly performed.

The last stage is that of desquamation; it commences between the eleventh and sixteenth days. The scabs, which present a dark or brownish appearance, are successively detached. This period lasts several days; sometimes two or three weeks even elapse before all the crusts separate. In the meantime the patient gradually recovers his health and former strength. After the fall of the crust, the cicatrix underneath presents a reddish appearance. This color gradually fades, and there remains an irregular depression, or pit, of a lighter color than the surrounding surface; and if there has been a full development of the eruption, disfiguring the patient for life.

Such is the clinical history of variola, when it is favorable, and its course is regular. The disease is sometimes irregular. In rare instances the eruption occurs almost at the commencement of the disease. The form is then very apt to be confluent. There are irregularities, also, in consequence of diarrhœa, hemorrhages, or other complications. I have known the eruption appear first on the limbs, and last on the trunk and face, and the appearance of the eruption is not always the same. In the anæmic and feeble child it often presents a pale color, with some induration at its base, but without the red areola around it, or with this quite indistinct. In rare instances the vesicles have a reddish color, their contents being tinged with blood. This form of variola is designated hemorrhagic. It indicates a profoundly altered state of the blood. The eruption in this form is of small size, and if the pock is broken, blood oozes from it.

VARIOLOID.—The course of varioloid is similar to that of variola, but it is somewhat shorter. It commences with rigors, followed by fever, headache, pain in the back, vomiting, drowsiness, and sometimes delirium, or even convulsions. The symptoms in the stage of invasion are, indeed, the same in character, and often nearly as severe as in variola. With the initial symptoms, there is also sometimes a scarlatiniform eruption, so that the disease may at first be mistaken for scarlatina. On the third or fourth day the variolous eruption commences. The number of pocks is commonly few, often not more than twelve to twenty. In the mildest form of varioloid, if the physician is not summoned in the

The cutaneous eruption has been traced to the vesicular stage. On or about the fifth day of the eruptive period, or eighth of small-pox, the vesicles gradually change their character, their contents becoming thicker and turbid. At the same time they increase somewhat in size, and the central depression disappears. This is designated the stage of maturation, or of suppuration, though it is known that the turbidity is due chiefly to another substance than pus. The pock having undergone these changes, is termed the pustule.

In discrete variola, and in varioloid, the fever returns during the pustular stage; or, if the form of the disease is confluent, and the fever has continued, it now becomes more intense. The return of fever, or its increase, is denoted by increased frequency of pulse, elevation of temperature, dryness of skin, anorexia, and thirst. A tendency to constipation remains throughout the disease in varioloid and discrete variola; in the confluent form, diarrhœa more frequently occurs, which, if it continue, is an unfavorable prognostic sign.

Other changes occur. The pustules increase somewhat in size, and become more globular. Some of them, when most distended, break through friction of the clothes, or scratching of the child, and their contents escaping, add to the loathsomeness of the disease. There is in the pustular stage more or less redness of the surface between the eruptions, and, except in the mildest cases, there is tumefaction from subcutaneous infiltration. In the confluent form, at this period, the features are often so swollen that the friends would not recognize the patient. The eyelids may be so œdematous that the eyes are for a time concealed from view. This œdema of the surface is not altogether absent in the vesicular stage, but it increases during the time of maturation, after which it subsides.

STAGE OF DESICCATION.—This immediately succeeds the full development of the pustules. The liquid portion of the contents of the pustules, which are broken, evaporates, leaving a crust. If there is no rupture, the liquid is absorbed, and a scab results, which, though smaller, preserves in a measure the form of the pustule. While the pustule desiccates, the surrounding inflammation rapidly abates. The crusts occur first upon the face, and on other parts in
the order in which the eruption ap
tient, at this time, is peculiar.
it is very offensive, and can be
side. Rilliet and Barthez call

tion progresses, the symptoms, local and general, abate. The pulse and temperature, if the case is favorable, return to their normal standard. The cough, hoarseness, and thirst disappear, while the appetite returns; the sleep is more tranquil, and the functions, generally, are more regularly performed.

The last stage is that of desquamation; it commences between the eleventh and sixteenth days. The scabs, which present a dark or brownish appearance, are successively detached. This period lasts several days; sometimes two or three weeks even elapse before all the crusts separate. In the meantime the patient gradually recovers his health and former strength. After the fall of the crust, the cicatrix underneath presents a reddish appearance. This color gradually fades, and there remains an irregular depression, or pit, of a lighter color than the surrounding surface; and if there has been a full development of the eruption, disfiguring the patient for life.

Such is the clinical history of variola, when it is favorable, and its course is regular. The disease is sometimes irregular. In rare instances the eruption occurs almost at the commencement of the disease. The form is then very apt to be confluent. There are irregularities, also, in consequence of diarrhœa, hemorrhages, or other complications. I have known the eruption appear first on the limbs, and last on the trunk and face, and the appearance of the eruption is not always the same. In the anæmic and feeble child it often presents a pale color, with some induration at its base, but without the red areola around it, or with this quite indistinct. In rare instances the vesicles have a reddish color, their contents being tinged with blood. This form of variola is designated hemorrhagic. It indicates a profoundly altered state of the blood. The eruption in this form is of small size, and if the pock is broken, blood oozes from it.

VARIOLOID.—The course of varioloid is similar to that of variola, but it is somewhat shorter. It commences with rigors, followed by fever, headache, pain in the back, vomiting, drowsiness, and sometimes delirium, or even convulsions. The symptoms in the stage of invasion are, indeed, the same in character, and often nearly as severe as in variola. With the initial symptoms, there is also sometimes a scarlatiniform eruption, so that the disease may at first be mistaken for scarlatina. On the third or fourth day the variolous eruption commences. The number of pocks is commonly few, often not more than twelve to twenty. In the mildest form of varioloid, if the physician is not summoned in the stage of invasion, he is not apt to be called at all, so that the patient may pass through the disease in ignorance of its nature. I have known this occur, the true character of the affection not being ascertained till others were affected, either with variola or varioloid.

The eruption pursues a more rapid course in varioloid than in the unmodified disease. By the fifth or sixth day the pustules are fully developed, though often smaller and less likely to be ruptured than in variola. Often, in varioloid, the eruption aborts. It remains papular two or three days, and then declines, or it may reach the vesicular stage, and decline without pustulation.

The constitutional symptoms in varioloid decline with the commencement of the eruptive stage. The secondary fever is slight or absent.

Such is the usual mild course of varioloid, but not always. If several years have elapsed since the vaccination, its protective power is greatly impaired, and varioloid may then exhibit as severe a form as ordinary smallpox. In some instances it is fatal.

The term varioloid is, as has been stated, applied to cases of variolous disease where there has been previous vaccination. It is also applied by writers to second attacks, whether the first occurred from infection or from variolous inoculation, but such cases are rare.

Mode of Death.—Death in smallpox occurs in several different ways. The most fatal period is the pustular stage. Feeble children not unfrequently die from exhaustion at or about the time that the pustules attain their greatest size. The eruption appears and becomes developed as usual, but there are evidences of weakness in the patient, and suddenly the progress of the vesicle or pustule ceases. It begins to subside, and its walls shrivel. There is evidently absorption, in part, of the liquid contents. These phenomena are of the gravest character. Death is the common result, and within twenty-four hours. In other cases death occurs from apnœa. The pock increasing in size in the larynx and trachea, obstructs inspiration, or there may be the formation of a pseudomembrane, as in true croup. This is not an unusual mode of death in young children, in whom the calibre of the larynx and trachea is small. Sometimes convulsions and coma occur in the last hours of life. In other cases the stage of desq [illegible] convalescence does not occur. The pat [illegible] anæmic and feeble, and finally death [illegible] vital powers. Again, after smallpo [illegible] hæmorrhagica may be developed. Hemorrhages occur from the gums, throat, nostrils. Blood is vomited, and evacuated in the stools. I have known death to occur in all these ways, but that from purpura is least frequent. Sometimes, as in scarlet fever, death occurs suddenly and unexpectedly in confluent, and even in discrete variola, when the previous symptoms had apparently been favorable. The patient is overpowered by the intensity of the virus.

ANATOMICAL CHARACTERS.—In those who have died of variola, without inflammatory or other complication, the heart-clots have been found small, dark, and soft. The blood is dark and thin. The vessels of the brain and its membranes are injected, so that numerous red points appear on the cut surface of this organ. The vessels of the lungs and the abdominal organs are congested, while the muscles present a deep red color. The variolous eruption penetrates more deeply than that of any other exanthematic fever. It has been stated elsewhere that it occurs not only on the skin, but often on the surface of the mouth, fauces, and air-passages. The mucous membrane in these situations is frequently also the seat of erythematic inflammation, being thickened and softened, and in some parts, as the larynx, a pseudo-membrane is occasionally produced, as in croup. This inflammation, erythematic or pseudomembranous, may occur without as well as with the presence of the specific eruption.

The eruption very seldom, perhaps never, appears upon the gastro-intestinal surface, but the solitary follicles and patches of Peyer are often enlarged, as in some other zymotic affections. The liver, spleen, and kidneys are commonly congested in those who have died of variola. The spleen, especially, is increased in volume and softened; the kidneys are enlarged, as if from commencing nephritis, and sometimes softened.

The minute structure of the pock is described by Rilliet and Barthez, and others. The vesicle is multilocular, consisting of at least five or six compartments, with distinct partitions. Its centre is united by fibrous bands to the derm beneath, which union gives rise to the umbilicated appearance. The giving way of these minute bands in the pustular stage occurs when the form changes from the umbilicated to the convex. In the pustular stage also, according to some, a fibrinous formation occurs within the pustule; according to others, this substance is of the nature of the epidermis, presenting the appearance of the cuticle when macerated. Mixed with this epidermic or fibrinous formation are pus cells.

COMPLICATIONS.—There are several different complications of variola. One is salivation. This is common in the adult, but rare in the child. When it occurs in the child, it is slight, commencing with or about the time of the eruption, and disappearing in from one to four or five days. Ophthalmia is another complication. Simple conjunctivitis, often quite intense, may occur in consequence of pustules developed under the lids. This inflammation subsides without injury to the eye, as the primary disease abates. A more serious inflammation occurs at an advanced stage of the disease, commencing in or near the desquamative period. This produces more or less chemosis, and sometimes opacity or ulceration of the cornea. A similar inflammation may occur in the ear, giving rise to otorrhœa, and even in some patients to rupture of the drum of the ear. Abscesses in the subcutaneous cellular tissue have been occasionally observed, especially in the confluent form. Subcutaneous infiltration and feebleness of constitution favor their occurrence. Suppuration within the joints is a somewhat rare complication or sequel, rendering convalescence protracted, if, indeed, the case is not fatal.

M. Béraud has published a memoir to show that orchitis complicates variola in the male, and ovaritis in the female. These inflammations are believed to be accompanied by a small and imperfect variolous eruption upon the tunica vaginalis and the peritoneal covering of the ovary. Trousseau states that he has often met this complication in the male, since his attention was called to it. It is mild, and subsides with the disappearance of the eruption. Laryngitis, simple or diphtheritic, bronchitis, pneumonia, pharyngitis, purpuric hemorrhages, gangrene of the mouth or other parts, œdema pulmonum, and œdema glottidis are occasional complications, some of which are frequent, others rare.

PROGNOSIS.—This depends on the age, vigor of system, form of the disease, and the presence or absence of complications. The younger the child, the greater the danger. Trousseau says: "Confluent variola, and even discrete variola, are almost always fatal in individuals less than two years old." Above the age of three or four years discrete variola usually ends favorably, but the confluent form is still, as a rule, fatal. Varioloid in the child is a mild disease, terminating favorably in a large proportion of cases. It is milder at this age than in the adult, on account of the more recent period of vaccination, and if a case of supposed varioloid is severe, and the eruption abundant, it is probable that the vaccination was spurious.

It is not necessary, from what has been said, to specify the favorable prognostic signs. The unfavorable prognostics are, great violence of the initial symptoms; early appearance of the eruption; an abundant eruption, especially if pale, and without swelling of the surface; rapid decline of the eruption in the vesicular or pustular stage; hemorrhagic eruption, or hemorrhages from the surfaces; fever continuing after the appearance of the eruption; diarrhœa persisting beyond the third or fourth day; delirium or great drowsiness; a frequent and feeble pulse; and, finally, obstructed respiration—if slow, indicating a pseudo-membrane or variolous eruption in the larynx or trachea—if rapid, indicating bronchitis or pneumonia.

DIAGNOSIS.—The diagnosis cannot be made with certainty prior to the eruptive stage. If, however, smallpox is prevalent, if the patient has not been vaccinated, and the symptoms which pertain to the period of invasion are present, as headache, pain in small of back, repeated vomiting, drowsiness, and perhaps convulsions, there is ground for the gravest suspicion. If, in addition to these symptoms, reddish points begin to appear on the second or third day, the diagnosis may be made with confidence. At this early period, even before there is any distinct cutaneous eruption, ash-colored spots may sometimes be observed on the buccal or faucial surface, the commencement of the variolous eruption; these possess considerable diagnostic value.

The scarlatiniform efflorescence, in the first stage of variola, sometimes leads to the belief that the disease is scarlet fever. The absence of the pharyngitis, and the appearance of the variolous eruption soon after the efflorescence, correct the diagnosis. Smallpox has, in the beginning of the eruptive period, sometimes been mistaken for measles. The points involved in the differential diagnosis have been presented in treating of that disease. After the development of the eruption it may be mistaken for varicella. The eruption of varicella is, however, preceded by symptoms which are milder and of shorter duration, and its appearance is different. It is irregular, instead of round; is not umbilicated, and it does not have the round, inflamed, and indurated base, which characterizes the variolous eruption. The eruption of ecthyma is sometimes umbilicated, but the symptoms of ecthyma and variola, and the progress of the eruptions in the two diseases, are very different.

TREATMENT.—Smallpox, like the other essential fevers, is self-limited, and therefore the constitutional treatment should be sustaining and palliative. In the first stages of the disease, the diet should be simple; gentle laxatives and refrigerant drinks are required if there is much febrile excitement. Lemonade is a grateful drink, and may be given in moderate quantity. Spiritus Mindereri or carbonic acid water may be allowed. As the disease advances, more nutritious food should be recommended; and in severe cases carbonate of ammonia, and even alcoholic stimulants, are required.

As confluent smallpox is nearly always, and the discrete form often, fatal in infancy, the physician should carefully watch the progress of the case in the infant. By judicious treatment, some, in this period of life, may be saved, who otherwise would perish. In the infant, depressing measures should be avoided. A laxative may be given, at first, if there is much fever, and the bowels are constipated; but the diet should be nutritious, and many soon require tonics and stimulants. If the pulse become more frequent and feeble, or if, with frequency of the pulse, the face and extremities become cool, or if, in the vesicular or pustular stage, the eruption suddenly subsides, alcoholic stimulants must be immediately employed, or the patient dies.

Such is an outline of the constitutional treatment required in smallpox. Sydenham inculcated a mode of treatment which experience has shown to be injurious in infancy and childhood. He had observed that the severity of the disease was ordinarily proportionate to the amount of eruption, and concluded from this fact that measures which retarded the development of the eruption were salutary; cold drinks, a cold apartment, scanty covering of the body, cathartics that caused derivation of blood from the surface, even sometimes the abstraction of blood, were considered, according to Sydenham's theory, to be useful as means of preventing full development of the eruption.

Sydenham's treatment, however appropriate it might sometimes be in case of robust adults, is unsuitable for children, because they do not, as a rule, tolerate, in this disease, measures which reduce the strength. Moreover, smallpox is rendered more dangerous by what Rilliet and Barthez designate perturbating treatment—treatment which renders it abnormal. The regular appearance and development of the eruption are requisite in order that the case may progress favorably. On the other hand, the opposite plan of treatment, which families, if left to themselves, are apt to adopt—namely, the employment of measures to promote pers tion, as hot drinks, and confinement in a heated room injurious.

The patient should be kept in a temperature such as he has been accustomed to, and such as is agreeable to him; his diet should be simple and nutritious; laxative medicine should only be given to procure the natural evacuations. In smallpox, as in all infectious diseases, free ventilation of the apartment is required.

While the general eruption in smallpox should not be interfered with, it is proper to endeavor to diminish, so far as possible, the size of the pocks, on parts exposed to view, so as to prevent disfigurement. Prof. Flint, in his *Treatise on the Practice of Medicine*, has published an excellent summary of the various measures which have been recommended for accomplishing this end. First: The opening and breaking up of the vesicle by means of a fine needle. This is tedious practice in confluent variola, but it can readily be performed in the discrete form—at least as regards the vesicles upon the face. This treatment was proposed by Rayer, and it is recommended by many who have tried it. Secondly: After the evacuation of the liquid, the cauterization of the vesicle by a pointed stick of nitrate of silver. Rilliet and Barthez say, in reference to this mode of treatment, "Individual cauterization of the pustules is, on the other hand, an almost infallible means of causing them to abort. To be successful, it is necessary to penetrate into the interior of the pustule with a pointed crayon of nitrate of silver, in order to cauterize the derm. . . . It is only the first or second day of the eruption that it (cauterization) has certain success; nevertheless, we have often seen it succeed the third or the fourth day, or even the fifth."

Thirdly: The application of tincture of iodine once or twice daily over the eruption when in the papular stage. Some writers, who have employed iodine, state that it does not prevent pitting, but diminishes it. Fourthly: The exclusion of light and air by means of a plaster. A mixture containing tannate of iron has been employed for this purpose in one of our hospitals. This produces a black mask. Light and air may also be excluded by smearing the face with sweet oil, and dusting twice daily upon the oiled surface a powder containing equal parts of subnitrate of bismuth and prepared chalk. Fifthly: The application of mild mercurial ointment upon the face or other parts of the surface, where it is desirable to render the eruption abortive. This mode of treatment does diminish the size of the vesicles and the pitting, but I should not recommend it for children. I have known in the adult severe mercurialization from its employment for four or five days, and, though young children do not exhibit so readily the effects of mercury, the use of the ointment, unless for a very limited period, increases, in my opinion, their feebleness, and diminishes the chance of their recovery. Calamine made into a paste with sweet oil is said to be equally effectual with mercurial ointment, and it produces no constitutional effect. Its effect is obviously similar to that of the bismuth and chalk employed with sweet oil as stated above. Of late, I have employed pulverized charcoal made into a thin paste with sweet oil or glycerine, and applied daily or twice daily to the face. It effectually excludes the light, and the result has been so good as regards pitting, that I shall continue to use it. Poultices, collodion, a solution of gutta percha in chloroform, have been recommended, among other substances, by good observers. If fissures or excoriations occur, an application may be made of oxide or carbonate of zinc in glycerine, one drachm to the ounce.

The prevention of smallpox, so far as practicable, is one of the important incidental duties of the physician. Isolation of the patient, and precautions in reference to his clothes and bedding, are imperatively required, so great is the infectiousness of this disease. The only certain means of prevention is confessedly vaccination, and providentially the incubative period of the vaccine disease is much less than that of variola. Therefore, smallpox may be prevented after the virus is received in the system, by timely and successful vaccination. Vaccination, at any period between the time of exposure and the commencement of the symptoms of invasion, will either prevent the occurrence of smallpox or modify it. If the symptoms of invasion have already commenced, it is uncertain whether it produces any modifying effect.

CHAPTER IV.

VACCINIA.

VACCINIA is a mild eruptive disease, which occasionally occurs among cattle, and has been propagated from them to man. It is characterized by the appearance upon the surface of one or more papules, which soon become vesicular, and then pustular. It is communicable by contact, but, unlike the other eruptive fevers, it is not infectious in man. It is inoculable, both by the liquid contained in the vesicle, which is designated vaccine lymph, and by the scab which results from the desiccation of the pustule.

To Gloucestershire, England, the honor belongs of discovering and popularizing the fact that vaccinia, a mild and comparatively harmless disease, is transmissible from the cow to man, and that it affords protection from smallpox. It appears that a vague opinion prevailed among the farmers of this dairying section, that a disease, which has since been designated vaccinia, was occasionally received from the cow in milking, the virus passing from a pustule on the teat to a sore or chap on the hand of the milker, and that those who thus contract the disease receive immunity from smallpox. As usually happens with important discoveries, so dull of apprehension is human intellect, these people, to whom Providence had revealed so important a fact, were blind to its real value. Finally, in the year 1774, Benjamin Jesty, whom the world has not sufficiently honored, "an honest and upright man," according to his epitaph, a farmer of Gloucestershire, had the courage to vaccinate his wife and two children. His excellent moral character did not shield him. He was regarded by his neighbors as an inhuman brute, who had performed an experiment on his own family, the tendency of which might be to transform them into beasts with horns.

The first essay in vaccination appears to have been entirely successful, but the prejudice against the operation continued. A fifth of a century passed, during which there was no extension of the benefits of this great discovery. At last, towards the close of the last century, Dr. Edward Jenner, a physician of Gloucestershire, and inoculator of his district, began to investigate this disease of the cow, about which little was known, and the grounds for the belief that it afforded protection from smallpox. Fortunately for the world, Jenner had been educated under John Hunter, and had learned from his great master to study nature rather than books, to be guided by experience and observations rather than by the dogmas of his predecessors or of the schools.

Jenner performed his first vaccination on the 14th of May, 1796, twenty-two years after Benjamin Jesty had lost his good name among his neighbors for vaccinating his own family. The popularizing of vaccination, mainly through Jenner's perseverance, affords one of the most interesting and instructive chapters in the history of medical science. How he went up to London, full of the importance of the discovery, and was there advised by his medical friends to desist from his wild schemes, lest he should injure the reputation which he had gained by publishing a creditable paper on the cuckoo; how he was allowed to vaccinate in the hospital wards, and gained some adherents to the new faith among the leading physicians of the metropolis; and finally, how, as the claims of vaccination began to be recognized, at the close of the last century and commencement of the present, a most acrimonious discussion arose, which filled all the medical journals of that period. The opponents of vaccination resorted to every device to prevent the acceptance of Jenner's views. They attempted to prejudice the people against them by specious arguments, by ridicule, and even by pictures. One of the leading journals contained the caricature of a cow covered with sores, and devouring children, and it was urged that vaccination was a bestial operation, degrading man to the level of the brute. But the truth had gained a firm hold, and the practice of vaccination extended.

The discovery of vaccinia, and of its protective power, cannot be too highly appreciated. It has, probably, done more to relieve human suffering than any other discovery of the last one hundred years, unless we except that of anæsthetics, and more to save human life than any other instrumentality of a purely physical kind.

The fact was established in the time of Jenner that the virus of smallpox inoculated in the cow produced vaccinia, which in its propagation back to man never returned to its original form, but always remained vaccinia. Moreover, Jenner believed that the disease known in the horse as the grease was identical in nature with vaccinia in the cow. He failed, however, in his experiments to communicate vaccinia from the horse, but other experimenters have been more successful. In 1801, a Dr. Loy, of the county of York, England, met two cases of vaccinia in persons who had taken care of a horse affected with the grease, and, from the lymph which he obtained, was able to produce vaccinia in the cow. In 1805, Viborg, a Danish veterinary surgeon, after many failures, succeeded also in communicating vaccinia to the cow by means of the virus taken from a horse.

From this time little light was thrown on this subject till within the last twelve years. Although Loy and Viborg, and perhaps a few others, had recorded their success, other experimenters had failed to communicate vaccinia from the horse. In the absence of additional cases, the profession began to question whether there might not have been some error in the observations of the gentlemen whose names I have mentioned, and the problem was still regarded as undetermined, whether a disease identical with vaccinia occurred in the horse, or a disease which might communicate vaccinia to the cow or to man.

Observations confirmatory of those of Loy and Viborg were at length, however, made, which must be regarded as conclusive. In 1856, in the department d'Eure-et-Loir, France, M. Pichot was consulted by a boy who had on the back of his hands vaccine pustules, which had apparently reached the eighth or ninth day. He had not taken care of nor been in contact with a cow, but had a few days before taken care of a horse affected with the grease. Vaccination was performed by means of the lymph taken from these pustules, and genuine vaccinia was produced.

Again, in 1860, an epidemic prevailed among the horses in Rieumes and Toulouse, France. A mare sickened with the disease, and there was swelling of the hòugh, with discharge of sanious matter. M. Delafosse vaccinated two cows with this matter, and communicated genuine vaccinia. This epidemic was believed by the veterinary surgeons to be an eruptive fever, differing in its nature somewhat from the disease or diseases which have ordinarily been designated the grease. It has been conjectured that two or more distinct affections of the horse have the same appellation, one of which, it is now admitted, is identical with vaccinia of the cow, and may communicate it. And the reason why so many experimenters have failed to vaccinate the cow from the horse is that they have used the virus of the wrong disease, or have taken matter from horses which had been affected with the true disease, but from ulcers which had lost their specific character.

Prior to the time of Jenner variolous inoculation was practised in most civilized countries, as variola produced in this way was found to be milder than when arising from infection. This practice is now obsolete; forbidden in some places by legislative enactments. It is superseded by vaccination. Vaccination, or the introduction of vaccine lymph into the system, is quickly and conveniently performed by scarifying with a lancet, and pressing into the incisions the lymph, or a little of the scab pulverized, and dissolved in a drop of cold water. It may also be performed by scraping off the epidermis with the edge of the instrument till the blood begins to ooze; and also, though with less certainty of success, by puncturing the skin with the point of the lancet, or by an instrument called the vaccinator.

If the child has a vascular nævus, this may be selected as the point of vaccination. Unless of large size, it can usually be cured by the inflammation which vaccinia produces. Statistics collected by Simon, as well as Marson, show that of those who contract varioloid, the larger the number of vaccine cicatrices the milder the disease, and the less the proportionate number of deaths. In Simon's statistics of those who stated that they had been vaccinated, but who presented no cicatrix, 21¾ per cent. died; of those who had one cicatrix, 7½ per cent. died; of those who had two, 4⅛ per cent. died; of those who had three, 1¾ per cent. died; while of those who had four or more cicatrices, only ¾ per cent. died. These statistics would seem to indicate the propriety of vaccinating in several places. But, so far as appears, when two or more cicatrices were observed, the patients may have been vaccinated at different times, at intervals, perhaps, of several years, and if so, the inference would not follow that more complete protection is produced by vaccinating in several places than in one. Moreover, if vaccination is performed in the usual manner by several incisions on the arm, and the virus is fresh and active, usually two or more distinct vesicles arise, which unite in their development, and probably protect the system as much as if they were separated by a wider space.

APPEARANCES, SYMPTOMS.—In genuine vaccination no effect is observed, except the slight inflammation due to the operation, till the close of the third day. Then the specific inflammation commences. This is indicated by a small red point, at first scarcely visible, indurated and slightly elevated, as determined by the touch, rather than by the eye. This increases, and on the fifth day the cuticle over the inflamed part begins to be raised by a transparent and thin liquid. The vesicle increases in diameter, and by the sixth day presents an umbilicated appearance, and is surrounded by a faint and narrow red zone. At the close of the eighth day the vesicle is fully developed. Its size varies considerably. It is usually from a sixth to a third of an inch in diameter, and oval or circular. If the vaccination has been performed by incisions, the size of the matured vesicle may be considerably larger, and its shape irregular, in consequence of the union of two or more vesicles. The eruption now presents a whitish or pearl-colored appearance, due to the whiteness of the cuticle, and the transparence of the liquid underneath. If the vaccination was performed by incisions, it is not unusual to observe over the centre of the vesicle, and adhering to it, a small yellowish scab, which has resulted from the scarification, and which contains none of the virus.

The vaccine vesicle, like that of variola, consists of compartments, commonly eight or ten, with complete partitions, so that there is no intercommunication. On the ninth day the inflamed areola becomes more distinct, and its diameter rapidly increases. Its color is deep red, its temperature is considerably elevated, and it is accompanied by more or less induration of the subcutaneous tissue, and it is tender to the touch. On the tenth day the pock has reached its full development. The areola then extends from one to two inches away from the vesicle, becoming fainter at its outer circumference, and gradually disappearing in the healthy skin. The shape of the outer circumference of the areola is irregular, projecting further at one point than another, though its general form is circular.

On the tenth day, when the inflammation has reached its maximum, the heat, itching, and tenderness in and around the pock are such that the child is often feverish and restless. Occasionally the glands of the axilla become swollen and tender. In other cases, in which there is but a moderate amount of inflammation, the constitutional disturbance is slight.

At the close of the tenth day, or on the eleventh, the inflammation begins to decline; the areola becomes narrower and then disappears; the induration and tenderness abate; and with this change the pustule desiccates, its liquid is absorbed, and there results a brownish or a dark mahogany-colored scab, which is detached, ordinarily, between the fourteenth and twenty-first days. The cicatrix, at first reddish, like all recent cicatrices, gradually becomes paler, and remains whiter than the surrounding integument. It presents several minute depressions or pits, which indicate the genuineness of the vaccination.

ANOMALIES, COMPLICATIONS, AND SEQUELS.—The vesicle is often broken, accidentally, or by the nails of the child. If the top of the vesicle is destroyed, or most of the compartments are opened, the inflammation is commonly increased, considerable suppuration occurs, and there results a large, irregular, yellowish scab, consisting of the virus mixed with desiccated pus. This scab is entirely unreliable, and unfit for the purpose of vaccination, though the protective power of the disease is not diminished by injury of the vesicles, even if it is totally destroyed. The cicatrix which results from extensive injury of the vesicle is apt to be large, and without the indented points which characterize the normal cicatrix.

In rare cases, when the inflammation which surrounds the vesicle is intense and deep-seated, suppuration occurs in the subjacent cellular tissue, giving rise to an abscess. This abscess is commonly of small size, but it increases the fretfulness and constitutional disturbance which attend vaccinia. This subcutaneous suppuration is believed to occur most frequently in those who have a scrofulous or vitiated state of system. Inflammation of the lymphatic glands of the axilla I have spoken of as not infrequent in vaccinia. This sometimes proceeds to suppuration, producing an unpleasant, though not serious, complication.

It sometimes happens that vesicles appear in other parts besides the points where the virus was inserted. These supernumerary vesicles commonly occur where the cuticle has been removed by scalds or injuries.

Trousseau relates the case of an infant whom he had vaccinated. On the eleventh day he was astonished to find twenty-seven vaccine pustules on the face, trunk, and limbs. This infant had, however, before the vaccination, a simple non-specific eruption over the whole body, and it was believed that it had produced these vaccinations by transferring the lymph, with its nails, to the various parts where the cuticle was denuded.

It is not unusual, also, to observe minute papules appearing on parts of the surface simultaneously with or soon after the vesicle, and in a few days declining. These seem to be abortive vaccine eruptions.

One of the most serious complications is erysipelas. This may occur directly from the operation, or from the inflammation caused by the vesicle, when the virus possesses no deleterious property; and, again, it may result from some unknown element in the virus. It may occur immediately after the operation, when it commonly prevents the working of the virus, or during the vesicular or pustular stage; or, again, after desiccation and separation of the scab. I have observed it commencing at all these periods.

Erysipelas, occurring as a complication of vaccinia, is invariably referred by the friends to the virus employed, and the physician who has had the misfortune to vaccinate is often unjustly blamed. In many of these cases there was a strong predisposition to erysipelas at the time of the vaccination, and the operation or the inflammation which accompanied the normal development of the vesicle served simply as an exciting cause. Erysipelas would occur as soon from a non-specific sore; indeed, we not unfrequently are called to cases of this disease in
menced from non-specific so
limbs. That the fault is

from the fact that other children, vaccinated with the same, have simple uncomplicated vaccinia.

Sometimes, on the other hand, the cause of erysipelas, whatever it may be, exists in the virus. For further facts in reference to this subject, the reader is referred to our remarks on erysipelas.

The fact is established by many observations that syphilis is communicable by vaccination. The symptoms of it may not appear till vaccinia has terminated, or for a little time subsequently, but it then constitutes a very serious sequel. A physician of this city, well known in this community as skilful in the diagnosis and treatment of skin diseases, and therefore not likely to be mistaken as regards the nature of the diseases, states that he communicated syphilis to two infants by vaccinating with the same scab. Both had the characteristic syphilitic eruption. Recently (January, 1868) an infant was brought to Prof. Alonzo Clark's clinique, in this city, having syphilitic rupia, which, in the opinion of the physicians present, was undoubtedly the result of vaccination.

Trousseau relates the case of a young woman, eighteen years old, who was vaccinated with virus taken from an infant apparently in perfect health. The vaccination was unsuccessful; but twenty-three days subsequently his attention was called to an eruption which had appeared in two places on the woman's arm, corresponding with the points where the virus had been inserted. The eruption was that of ecthyma, which, by the next examination, which was five days subsequently, had been transformed into rupia. The axillary lymphatic glands were tumefied and indolent, and, finally, roseola appeared, which removed all doubts as to the syphilitic character of the disease. There was syphilitic infection, which first manifested itself in the points where vaccination had been performed (*Article de la Vaccine*). It is not ascertained in Prof. Clark's case, nor is it stated in Trousseau's, whether the lymph or scab was employed for vaccination; but it is probable that the danger of syphilitic infection is much greater from the scab than from the lymph, on account of the amount of animal matter which it contains.

The vesicle in genuine vaccinia is sometimes very small, not having a diameter of more than two lines. Occasionally the development of the vesicle is retarded. It does not appear till two or three days later than the usual time, or even a longer period.

Vaccinia is modified by certain diseases. It is arrested by measles and scarlet fever, pursuing its course after the subsidence of the exanthem. On the other hand, it arrests the paroxysmal cough of pertussis, which returns when the pock begins to desiccate. Eczematous eruptions sometimes occur after vaccinia, as they often do after the other eruptive fevers; or, if already present, they may be aggravated.

Subsequent Vaccinations.

A second vaccination, performed prior to the ninth day after the first vaccination, is successful. A genuine vaccine eruption results, which is smaller the more advanced the primary disease. This second eruption overtakes the first. On the ninth day the susceptibility to vaccinia is, in most cases, lost; so that vaccination performed on the tenth, or subsequent days, is unsuccessful.

As a rule, a zymotic disease occurs only once in the same individual. Vaccinia is an exception. In most cases, after a few years, it can be produced a second time; and cases of a third or fourth successful vaccination, at intervals of a few years, are not uncommon. Now, subsequent cases of vaccinia differ from the first, which has been described above. The period of incubation is shorter, and the vesicular, pustular, and desiccative stages succeed each other more rapidly, so that the whole period of the disease is less. The variation from the appearance and course of the first vesicle is proportionate to the degree of protection which the first vaccination still affords, both as regards smallpox and vaccinia. If several years have elapsed since the first vaccination, and the protective power which it afforded is nearly lost, the second vaccinia differs but little from the first. If, on the other hand, the first vaccination still affords nearly complete protection, the result of the second is slight; the eruption is insignificant, lacking the characteristic appearance of the vaccine vesicle, resembling a common sore, and disappearing within a week. It is accompanied by no inflamed areola, and by no constitutional disturbance.

Vaccination often produces no result. This is sometimes due to the fact that the lymph or scab employed is useless. It has spoiled by keeping, or never has been good. In other cases it is due to a lack of susceptibility in the person. Some take vaccinia with difficulty, and only after several vaccinations; just as children, though fully exposed, often fail to take meas or scarlet fever, on account
of a condition of the system wl prevents the reception of the
virus, or antagonizes and cont
after vaccination, an eruptio
be genuine; but it immed

broken. A large, yellow, uneven scab results, having none of the appearance, and containing little or none of the vaccine virus. This scab, as well as the liquid matter which preceded the formation of the scab, is utterly useless for the purpose of vaccination, and, if so employed, will probably cause a sore from its irritating effect, but not of a specific character. If, in place of the true vaccine vesicle, the eruption presents the appearance which I have described, namely, that of a pustule, soon breaking, and forming a large, irregular, yellowish scab, the vaccinia—if it is correct so to designate it—must be considered spurious. A sore has been produced by the animal matter which was employed in the vaccination along with the virus, which has modified the action of the virus, and probably has rendered it useless as a means of protection; or there may have been no virus inserted with this animal matter. The physician should in such cases insist on a second vaccination.

Cases like the above are of frequent occurrence, and the parents of the child are often satisfied with the result. They see an eruption following the vaccination, accompanied by considerable inflammation, and leaving a cicatrix. Unless undeceived by the physician, they are apt to remain in the belief of the child's security, until, perhaps, it takes smallpox. Such cases, obviously, tend to diminish the confidence which the public should have in vaccination as a means of protection from smallpox, and on account of their frequent occurrence it is important in all cases that the physician should see the result of his vaccination. It has been proposed, as a means of determining the genuineness of the vaccinia, to revaccinate when the eruption begins, and if the first is genuine, the second will overtake it. This is called Brice's test; but it is not necessary, since the physician, familiar with the appearance of the true vesicle, can determine at once its genuineness by the sight.

Protection from Vaccination—Revaccination.

It was believed by the early advocates of vaccination that the general performance of this operation would soon eradicate smallpox from the community, so that it would be regarded as a disease of the past, rather than of the present time. This result, however, is not achieved. As a rule, the greater the benefit of any measure designed to ameliorate the condition of mankind, the greater and more numerous are the obstacles which diminish its effectiveness. Science is full of examples of this. Fortunately these obstacles, as regards vaccination, are not such as to impair the confidence of physicians in its protective power, and it is not too much to expect that this simple operation will yet be the means of rendering smallpox a disease almost unknown, unless in its modified form.

Vaccination should be performed in the first year of life. In the country, where there is little danger of exposure to smallpox, it may be deferred till the age of ten or twelve months. In the city, on the other hand, where there is constant intercourse of people, and where contagious diseases are often contracted without its being known when exposure occurred, an earlier vaccination is advisable. Some physicians recommend performance of the operation as early as the age of four to six weeks. The objection to this is, that if erysipelas occur, so young an infant is apt to perish from it, whereas an infant three or four months old ordinarily recovers. For this reason I believe that the most suitable age is about four months for the city infant, in ordinary times; but if smallpox is epidemic, vaccination should be performed at an earlier age. I have vaccinated even the new-born infant when smallpox had broken out in adjoining apartments.

Vaccinia usually extinguishes, for a time, the susceptibility to smallpox. According to M. Gintrac, varioloid does not occur within two years in those who have been vaccinated. It may, however, in exceptional instances, occur in a mild form within a few months after vaccination. The protection afforded by vaccination gradually diminishes by time, but it does not, probably, as a rule, cease entirely. Varioloid, however, occurring thirty or forty years after a successful vaccination, is apt to be severe, and it may even be fatal, showing that it has been but slightly modified. In other cases, even after so long an interval, the symptoms present a degree of mildness which indicates that the protective power of the vaccination is not entirely lost.

If a second vaccination is practised soon after the scab from the first vaccination has fallen, it will usually produce no result, but in other cases it gives rise to a little redness, swelling, and induration, which show that vaccinia has been reproduced, though in a very mild and insignificant form. It is probable that in these cases varioloid might also occur by exposure, though with a mildness corresponding with that of the vaccinia. The longer the period after the first vaccination, the greater the number of those in whom a second vaccination is effective, and, as has already been intimated, the greater also the liability to the variolous disease if a second vaccination is not performed. It is recommended, therefore, to perform a second vaccination not later than the sixth or eighth year, and again in childhood. And if smallpox is epidemic, it is proper to vaccinate all who have not been vaccinated within three or four years.

Selection of Virus.

The lymph is preferable to the scab for vaccination, provided that it can be obtained fresh. The scab is more easily preserved, and, therefore, if the lymph and scab are old, the latter is to be preferred. The lymph should, if the vesicle is sufficiently developed, be taken on the fifth day. It may also be taken on the sixth, seventh, or even eighth day, provided that the areola has not formed. The lymph of the fifth day acts with greater energy, though that of the sixth or seventh day is not much inferior. Lymph obtained after the formation of the areola is less efficient, though it may communicate the genuine disease.

There is no mode of vaccination so reliable as the use of lymph, taken directly from the arm and immediately inserted—the arm to arm vaccination. Lymph can be preserved for a few days on a flattened surface of whalebone, or the segment of a quill; the former I prefer, and if employed within a week, it will usually communicate vaccinia. Lymph may be preserved a longer period between two surfaces of glass, but the best way of preserving it is in capillary glass tubes. The end of the tube is placed within the vesicle, and the lymph ascends by capillary attraction. When a sufficient quantity is received, the ends are sealed, by holding them for a moment in a flame. Care is requisite in doing this, so as not to heat the lymph, as it is spoiled by a temperature much above the body. When the lymph is used, the ends of the tube are broken, and by blowing gently through it, a sufficient quantity is received on the point of a lancet.

If the scab is genuine, it presents a dark-brown or mahogany color, and has a circular, oval, or at least a rounded form; it is firm, or compact, and has a lustre. Soft, yellowish, and irregular scabs are not genuine, and those of a dull appearance, or without lustre, have usually spoiled in the keeping. It is the belief of many that the vaccine virus gradually becomes weaker by passing successively through the human system (Condie, *American Journal of the Medical Sciences*, April, 1865), and that therefore different specimens of virus work with different energy, according to the degree of removal from the cow. To what extent this view is correct is not fully ascertained, but, certainly, if the virus employed continues to produce a small vesicle, and attended only by little inflammation, there is reason to believe that the protection which it imparts is less than that from virus which works with greater energy, and it should be exchanged for such. The scab is best preserved in soft beeswax, which excludes the air, and it should be kept in a cool place.

CHAPTER V.

VARICELLA.

VARICELLA, chickenpox or swinepox, is the shortest and mildest of the eruptive fevers. It is highly infectious, so that few children escape who are exposed to it. Its period of incubation is from fifteen to seventeen days. It is not inoculable, or at least those who have attempted to inoculate with the lymph of varicella have failed. I endeavored to communicate the disease in this way some years ago, but without result. It attacks the same individual but once, and it occurs as an epidemic. It has been thought by some to prevail most immediately before, during, or after epidemics of smallpox, and it has been conjectured that it is a modified form of variola, and hence its name, which signifies little variola. This idea is, however, entertained by few, and it is opposed by the following facts. Varicella may occur after variola, or variola after varicella, without any modification, and the two diseases are very dissimilar as regards gravity of symptoms and duration. The variolous disease, whether smallpox or varioloid, often occurs in the adult; varicella, on the other hand, is a disease of infancy and childhood. Professor Flint states that he has observed it in the adult, but its occurrence at this period of life is rare. Moreover varicella and variola have been known to occur simultaneously in the same individual. Such a case was reported by M. Delpech, in a memoir published in 1845.

SYMPTOMS.—Varicella usually commences with such symptoms as usher in ordinary mild febrile attacks, namely, headache, languor, chilliness, and sometimes aching in e back and limbs. Fever supervenes, which is usually mode
100 or 112, and the thermomete
ture, but less than occurs i

symptoms, which precede the eruption, are sometimes absent, or are so mild as to escape notice. The fever usually ceases on the second day, but it may return on the following night. The appetite is rarely lost, and most children continue, more or less, at their amusements.

The eruption commences in about twenty-four hours, appearing as small red points, first over the trunk, and soon afterwards over the face and limbs. These points, which are at first minute papules, become vesicular in the course of a few hours. The occurrence of the vesicular stage is nearly simultaneous on all parts of the surface. The vesicles lack the hard, indurated base of the variolous eruption, though they are sometimes surrounded by a faint zone of redness. They differ also from the variolous eruption in the absence of umbilication, and in irregularity of shape. Some are small and acuminate, some hemispherical, and of medium size, and others oval or elongated, and of large size. The inflammation is quite superficial, not involving the subcutaneous tissue, and scarcely affecting the deepest layer of the skin.

The vesicles vary in size from the diameter of half a line to that of even three lines. They occasionally give rise to slight itching. On the second day of the eruption, or third of the disease, the vesicles are still fully developed, their liquid contents being nearly transparent. At the close of this day the liquid begins to be somewhat cloudy, and its absorption commences. On the fourth day of the disease desiccation progresses rapidly, and by the fifth the liquid has for the most part disappeared, and there results a scab, small and thin, of a yellowish-brown color. The scabs are soon detached, the redness which indicated their seat disappears, the epiderm which had been raised and removed by the eruption is reproduced in its normal state, and in a few days all evidence of varicella is effaced. A cicatrix occasionally results, but it is due not to the simple varicellar eruption, but to a sore produced from the eruption by the scratching of the child.

The number of vesicles varies considerably in different cases. They are never, so far as I have observed, confluent; but they are sometimes so abundant in young children that, if the disease were variola, it would be called severe discrete.

Diagnosis.—Obviously the only diseases with which varicella is liable to be confounded are such as present vesicles at some stage of their course. From the local vesicular eruptions this disease is diagnosticated by the fact that the vesicles appear on all parts of the surface. It is sometimes mistaken for variola or varioloid, or *vice versâ*—a mistake very damaging to the reputation of the physician. The points of differential diagnosis are the symptoms of invasion—severe, and lasting three or four days in the one; mild, and continuing only one day in the other—an eruption passing slowly through its stages from the papulæ to the pustulæ, umbilicated, with circular, raised, and inflamed base, appearing first on the face and neck, and not till a day later on the legs, in the one disease; while in the other the evolution, shape, and course of the eruption, as described above, are materially different. By proper attention to these distinctive features it is rarely difficult to diagnosticate the two diseases.

The PROGNOSIS in varicella is always favorable. It does not, of itself, endanger life, nor seriously incommode the patient; nor does it give rise to complications nor sequels. The TREATMENT, therefore, is the simplest possible. Mild diet, and a laxative, may be prescribed during the febrile period; but nothing further is required.

SECTION III.

NON-ERUPTIVE CONTAGIOUS DISEASES.

CHAPTER I.

DIPHTHERIA.

THE term diphtheria, or diphtheritis, is applied to a blood disease, which, like measles or scarlet fever, has a local inflammatory manifestation. The inflammation occurs on mucous surfaces, and the skin when denuded of its epidermis, and is attended by fibrinous exudation. Diphtheria has of late years attracted much attention on the part of physicians as well as the public, on account of its epidemic visitation in many different localities, and the great mortality which has uniformly attended it. It has, of late years, been the subject of frequent discussion in the medical societies of Europe and this country, and the journals during this period contain numerous reports of cases, and many monographs designed to elucidate its nature. Though there is much that is still obscure in reference to diphtheria, the great interest which it has awakened has led to a better understanding of its nature, and a more judicious use of therapeutic agents.

Diphtheria presents itself under two forms, primary and secondary. The primary is more common. The secondary is usually a complication or a sequel of scarlet fever or measles, or more rarely of typhoid fever, and this form is, therefore, chiefly observed when these diseases are epidemic. The two forms are identical in nature, symptoms, and appearance; the difference consisting in the fact that diphtheria, when occurring as a complication or sequel, is more serious, and apt to be fatal. Ordinarily this secondary form commences before the primary affection abates, so that there is no intermission between the two pathological states. The fevers which we have mentioned probably predispose to diphtheria, not only from the affinity which exists between them and that disease in conseof the fibrin with which it is infiltrated. Sometimes the pseudo-membrane has a reddish tinge. This is due to rupture of the capillaries, and the escape of the blood corpuscles. It occurs in those cases in which the inflammation is intense, and the capillaries are greatly engorged. Sometimes the lower part of the exudation is blood-strained, while the exposed surface has the usual grayish-white hue. (Appendix C.)

During the height of the inflammation it is astonishing often to see with what rapidity the diphtheritic membrane returns, when removed by force. A few hours often suffice to restore it as firm and extensive as before the interference. If the exudation is examined with the microscope as soon as it appears upon the faucial surface, it is seen to consist largely of cells, to wit, plastic nuclei and pus cells mixed with epithelia; with these elements, we find amorphous matter, and ordinarily delicate interlacing fibrillæ. Subsequently fibrillation is more complete, and the false membrane consequently more firm and resisting. In feeble children fibrillation is sometimes lacking, or is so slight as not to be observed with the microscope. In these cases the pseudo-membrane is cellular and amorphous, and is easily detached. Such was its microscopic character in a case which occurred in the Nursery and Child's Hospital of this city; the inflammatory product in this patient covered the mucous membrane of the stomach, as well as those parts which are commonly the seat of it. This case I shall allude to again.

By the microscope we are able to detect, in some instances, a confervoid growth in or upon the pseudo-membrane. This is commonly the oidium albicans, or a plant closely allied to it, or the lepothrix buccalis, and its presence has led some observers to think that the primary and essential part of the adventitious formation is parasitic. Fortunately, so erroneous an idea of the pathology of diphtheria is easily disproved, for in most cases of this disease no vegetable growth can be detected. The pseudo-membrane does, however, constitute a favorable nidus for the growth of confervæ, like any animal matter of low vitality, or of no vitality, and hence the cause of their appearance upon the fauces in this disease. Confervæ sometimes also grow upon the inflamed surface in simple pharyngitis, producing an appearance which simulates closely that of the diphtheritic membrane, and it is apt to be mistaken for it unless its true character is determined by the microscope. As an example of the simple inflammation simulating the pseudo-membranous, may be mentioned the case of a little girl in this

The intensity as well as the extent of the phlegmasia varies, however, considerably in different patients. In a mild attack it is often limited to a part of the fauces, and in these cases there are few exceptions to the rule that the tonsillar portion is affected, the redness gradually fading away in the healthy membrane beyond. There is swelling of the tonsils themselves, so that often they nearly touch each other. If the pharyngitis is general, the passage through this portion of the digestive tube is greatly diminished, but in most cases no more, and in many children not so much as in severe simple pharyngitis.

Within a day, and usually within a few hours, from the commencement of the inflammation, a small semi-transparent and almost diffluent point is observed upon the part most inflamed, or a thin film, of little importance, did the disease stop here, but very significant as a diagnostic sign, and as a forerunner of what is to happen. This substance, which is fibrinous, gradually becomes firmer, and at the same time thicker and broader, presenting a grayish or a grayish-white color. Sometimes different points or patches are observed, which extend and coalesce so that the fauces are almost entirely concealed from view. The pseudo-membrane is closely attached to the mucous surface, which it penetrates, becoming firm, and not easily detached. Attempts to separate it often lacerate the engorged capillaries, producing a free flow of blood. It does not ordinarily attain a greater thickness than one-eighth to one-sixth of an inch. I have seen it, however, not far from one-third of an inch thick.

The same pseudo-membrane is often firmer in one part than another, the outer and central portions being more compact and tough for a time than that underneath, which is more recent, and in which there is less fibrillation. After a few days, however, decomposition commences, and then that which was first formed becomes softer than the more recent production. When this occurs, the color of the exudation changes from a whitish or a grayish-white to a dirty brown, and its exposed surface is uneven and jagged from the partial separation of shreds and fibres.

The escape of the liquor sanguinis from the engorged vessels diminishes somewhat the turgescence of the inflamed tissue. If this is considerable, the pseudo-membrane often sinks below the level of the surrounding surface, producing an appearance very much like that of an ulcer, or even of gangrene. Though there is no loss of substance in this particular state of the surface, it does, however, often occur, being produced by the presence and contraction of the fibrin with which it is infiltrated. Sometimes the pseudo-membrane has a reddish tinge. This is due to rupture of the capillaries, and the escape of the blood corpuscles. It occurs in those cases in which the inflammation is intense, and the capillaries are greatly engorged. Sometimes the lower part of the exudation is blood-strained, while the exposed surface has the usual grayish-white hue. (Appendix C.)

During the height of the inflammation it is astonishing often to see with what rapidity the diphtheritic membrane returns, when removed by force. A few hours often suffice to restore it as firm and extensive as before the interference. If the exudation is examined with the microscope as soon as it appears upon the faucial surface, it is seen to consist largely of cells, to wit, plastic nuclei and pus cells mixed with epithelia; with these elements, we find amorphous matter, and ordinarily delicate interlacing fibrillæ. Subsequently fibrillation is more complete, and the false membrane consequently more firm and resisting. In feeble children fibrillation is sometimes lacking, or is so slight as not to be observed with the microscope. In these cases the pseudo-membrane is cellular and amorphous, and is easily detached. Such was its microscopic character in a case which occurred in the Nursery and Child's Hospital of this city; the inflammatory product in this patient covered the mucous membrane of the stomach, as well as those parts which are commonly the seat of it. This case I shall allude to again.

By the microscope we are able to detect, in some instances, a confervoid growth in or upon the pseudo-membrane. This is commonly the oidium albicans, or a plant closely allied to it, or the lepothrix buccalis, and its presence has led some observers to think that the primary and essential part of the adventitious formation is parasitic. Fortunately, so erroneous an idea of the pathology of diphtheria is easily disproved, for in most cases of this disease no vegetable growth can be detected. The pseudo-membrane does, however, constitute a favorable nidus for the growth of confervæ, like any animal matter of low vitality, or of no vitality, and hence the cause of their appearance upon the fauces in this disease. Confervæ sometimes also grow upon the inflamed surface in simple pharyngitis, producing an appearance hich simulates closely that of the diphtheritic membrane, and it
unless its true character is determ
an example of the simple inflam
membranous, may be mentio

city, whom I was called to attend when diphtheria was prevailing. There was in this patient intense faucial inflammation, with a grayish-white substance like fibrin over one tonsil. This substance, examined with the microscope, was found to consist of the lepothrix buccalis, with epithelia and amorphous matter. The disease, which was speedily cured, would without microscopic examination have passed for diphtheria.

In favorable cases the false membrane is detached in a few days, and is either expectorated or swallowed with the ingesta. Its separation is promoted by the secretions underneath, especially by pus, which is formed in abundance between it and the surface on which it lies and which it penetrates. In many, perhaps a majority of cases, however, it does not separate in mass, but by progressive liquefaction. A little less of the pseudo-membrane is observed at each visit, until it entirely disappears. Such are the appearance, character, and history of the pseudo-membrane in this disease. Its common seat is upon the fauces, and in mild cases it is ordinarily found there alone. Unfortunately, the nature of diphtheria as a blood disease renders all the mucous surfaces liable to be attacked by the inflammation, and therefore in severe cases, and even in cases of moderate severity, we often find this product elsewhere, as well as upon the fauces, and in localities where, from its mechanical effect, it greatly increases the danger, and even compromises life. The mucous membrane of the nostrils, mouth, larynx, trachea, œsophagus, stomach, conjunctiva, vagina, and even the delicate lining of the external ear, are at times the seat of diphtheritic inflammation, with the characteristic product. If the exudation occur in the larynx, or air-passages below the larynx, we have the phenomena and result of true croup; if upon a surface concerned in the digestive process, this function is more or less interfered with. I have already alluded to a case which occurred in the Nursery and Child's Hospital of this city, in which patient the surface of the stomach was almost completely lined with the diphtheritic formation, so that the function of this organ was apparently nearly or quite abolished. The occurrence of the pseudo-membrane in the nares is common, and is attended by the discharge of thin mucus and pus; but though inconvenient to the patient, its presence in this situation is not dangerous, except in the nursing infant, in whom it interferes more or less with lactation. The thin irritating discharge produces excoriation around the nostrils and upon the upper lip.

Diphtheria is ordinarily attended by inflammation of the cervical glands, which lie in the connective tissue behind and below the angle of the lower jaw, and in cases of great severity this tissue is also involved, becoming swollen and indurated. The adenitis begins early, and corresponds in degree with the pharyngeal inflammation. It is never or very seldom as great in simple pharyngitis as in this disease. Great external swelling of the neck, indicating a grave form of diphtheria, is, therefore, to be regarded as an unfavorable sign. The inflamed glands and connective tissue are hard and tender on pressure, but they less frequently suppurate than when similarly affected in scarlet fever. I have known but two instances of suppuration, the pus in both escaping externally through the skin.

The exudation occurs also on the cutaneous surface when blistered or abraded, and upon the edges of the wound produced by tracheotomy. This fact is interesting, as showing the pervading character of the diphtheritic virus.

Bronchitis is often present in diphtheria, with or without fibrinous exudation in the tube. Pneumonia is also so often present, that its occurrence is something more than mere coincidence.

In those who have died of diphtheria the blood has been found of a dark-red color, sometimes almost brown. Its appearance has been compared, on account of its color, to prune-juice. This color is due, partly, in those who have died from apnœa in consequence of exudation in the larynx, to imperfect oxygenation of the blood, but it is also due to the malignant nature of the disease, as in the worst forms of scarlet and typhus fevers. The heart-clots are dark and soft.

Apart from inflammation of the tonsils and cervical glands, the glandular organs are not changed in their anatomical character, so far as ascertained, with the exception of the kidneys. The state of the kidneys, and character of the urine, will be described hereafter.

SYMPTOMS.—As with other contagious diseases, the symptoms vary greatly in intensity in different cases. In general, in the commencement of an epidemic, diphtheria is more severe and fatal, and its symptoms more violent, than when the epidemic influence is abating. The prominent symptoms are, however, often disproportionate to the gravity of the attack. Striking examples of this fact might be given from cases in my practice, the friends not supposing that there was any serious ailment, and not seeking medical advice till the fatal termination had nearly arrived. Diphtheria corresponds, in this respect, with all those affections in which the blood is profoundly altered.

The invasion of this disease *may* be gradual. There is a degree of chilliness, with rigors, often slight, succeeded by more or less fever, headache, languor, and loss of appetite. Still, the patient, if old enough, continues to walk about as if affected with a slight and temporary ailment. The symptoms are like those of a cold, for which, indeed, the initial stage of diphtheria is often mistaken. With many, one of the first symptoms is slight tenderness or a sensation of fulness in the fauces. A distinguished clergyman of the Pacific coast, who fell a victim to this disease, dreamed a few nights before he complained of illness that his throat was cut. Doubtless the diphtheritic inflammation had already commenced, so that what seemed a forewarning had a natural explanation. So insidious was the commencement in this case, that the disease had advanced beyond all hope of relief when medical advice was first sought.

In other cases the invasion is more abrupt and severe. Great febrile reaction, headache, pain in the ear, aching of the limbs, and loss of strength, compel the patient to take to bed from the first. Delirium may be present, but it is unusual.

The symptoms of invasion have but little prognostic value. I have met cases with a severe commencement, attended by delirium, which terminated in complete restoration to health in less than a week, the presence of the membrane upon the fauces, and the occurrence of diphtheria in other members of the family, rendering the diagnosis certain. On the other hand, the milder commencement frequently ushers in a fatal form of the disease.

The slight soreness of the throat or sensation of fulness, which accompanies the initial stage of diphtheria, does not ordinarily become any more severe during the course of the attack, and it often disappears within a few days. The pain on swallowing, and the tenderness when pressure is made upon the throat, are usually less than in quinsy or simple pharyngitis. The absence or mildness of local symptoms is the main reason why the disease is so often overlooked in its first stages. I have known more than once, in consequence of the slight tenderness in the throat, the large external swelling to be mistaken for that of mumps, till an incurable stage of the affection was reached. I was once asked to see a little girl about ten years old, on account of this external swelling, which was limited to one side, and the character of which the parents did not understand. A physician visiting near by a few days previously, had been asked to see this patient, and, without examining the fauces, attributed the swelling to inflammation of the root of a tooth, and had not thought it necessary to repeat his visit. This child, now within three or four days of her death, was walking about, not complaining of her throat, but with poor appetite, and with the pale, cachectic aspect so common in advanced diphtheria, and having severe inflammation of the fauces, with a thick and firm pseudo-membrane extending from the pharynx forward to the arch of the mouth. The mildness of subjective symptoms was strikingly shown in another case which came to my notice. A little girl had been ailing a few days, and had the external cervical swelling, but continued about the house and amused herself with playthings, even jumping the rope a few times on the day of her death. Finally, she sank rapidly of exhaustion, dying before a physician could arrive. These sudden and unexpected deaths in diphtheria are due to the profoundly altered state of the blood. If the inflammation invade the larynx, then the symptoms are immediately conspicuous and alarming.

The tongue in diphtheria is covered with a moist fur; sometimes more or less of the exudation appears upon it; the appetite is poor; bowels regular. The pulse in different cases varies greatly in volume and frequency. It is often full and strong in the first days of the disease, but in the latter part, when death from asthenia approaches, it is feeble and frequent. At first there are no marked symptoms referable to the respiratory apparatus. There is only that degree of acceleration of respiration which corresponds with the amount of fever. In many cases, favorable as well as unfavorable, there is no cough and no embarrassment of respiration throughout the entire sickness, though the inflammation of the faucial surface may be general and severe, and the constitutional disturbance very decided. But ordinarily, in the course of a few days from the inception of the disease, the swelling of the nasal mucous membrane, and the occurrence of exudation upon it, produce snuffling respiration. The occurrence of the phlegmasia upon the laryngo-tracheal surface is indicated by hoarseness of the voice, and an occasional dry cough, and as the inflammation extends and the pseudo-membrane forms, the cough becomes more frequent, and harsh or raucous, as in true croup. Indeed, the condition of the patient, as regards the larynx and trachea in diphtheria, when they are the seat of fibrinous exudation, resembles that in true croup. As the inflammation in the larynx and trachea, when accompanied by fibrinous exudation, is rarely ame
of obstructed respiration beco
disease advances, till final

tion is protracted and whistling, and accompanied by great depression of the ribs; the countenance is anxious and pallid; the prolabia and fingers livid, and the little patient in vain seeks for relief by change of position. Occasionally, by great effort on the part of the child, or by fortunate treatment, a portion of the pseudo-membrane is expectorated, and for some hours there is apparently marked improvement, but it is only in exceptional cases that the membranous formation is not speedily and fully reproduced. As death draws near, the cough diminishes both in frequency and force.

In cases of a severe type the breath is ordinarily offensive, having a gangrenous odor. There is in such patients intense pharyngitis, with a pseudo-membrane which, from its low vitality, rapidly undergoes decay, and also great external swelling from the adenitis and cellulitis.

An efflorescence is sometimes observed upon the surface during the period when the temperature of the skin is exalted. This rash does not differ from ordinary erythema so common in the febrile and inflammatory affections of infancy and early childhood. It is not attended by the minute papulæ which produce roughness of the surface in scarlet fever. It is the erythema fugax of dermatologists suddenly appearing, and after some hours as suddenly disappearing. In many patients it is absent, and it is seldom if ever observed, except in the first days, when there is an active circulation.

The symptoms pertaining to the nervous system, which are ordinarily most prominent, I have already described. I have described the cephalalgia and muscular pains, which are present in the initial period, but they soon abate. Convulsions may occur in young children, but not oftener than in other diseases attended by febrile reaction.

The heat of surface is in most cases less than in scarlet fever; it abates in a few days, and in advanced stages of the disease the temperature is natural or less than natural. The abdominal organs are seldom much affected in diphtheria, so far as ascertained, with the exception of the kidneys. There have not been many chemical examinations of the urine in this disease, but in a few which have been made (Sanderson, *British and Foreign Medico-Chir. Rev.*, January, 1860), the quantity of urea excreted daily was found to be considerably more than when convalescence had commenced. The most interesting and important change, however, in the constitution of the urine, is the occurrence of albumen in it. This element was first discovered by Mr. Wade, of Birmingham, in 1857, and since then various observations in different epidemics and localities establish the fact that albuminuria occurs in the majority of cases of severe diphtheria, and in many of a mild form. It often occurs at an early period, but in other patients it does not appear till the close of the first week, or commencement of the second. It continues three or four days to as many weeks, when in favorable cases it gradually becomes less and soon disappears. While albuminuria is more common in diphtheria than in scarlet fever, the quantity of albumen in the urine is ordinarily less than in that disease. The albuminuria of diphtheria is further distinguished from that of scarlet fever in the fact already stated, that it ordinarily occurs in the midst of the disease, and is attended by slight anasarca, often by none, whereas in scarlet fever it occurs after the subsidence of the fever, is attended by greater anasarca, and even serous effusion in the cavities. If we examine the albuminous urine of diphtheria with the microscope, we find in it fibrinous casts and altered renal epithelial cells. These cells are opaque or granular, mainly from the deposit of fatty particles in their interior. But this appearance of the cells is not peculiar to diphtheritic albuminuria.

Albuminuria in diphtheritic patients is, in the present state of our knowledge, rather a matter of scientific interest than of practical importance. It does not seem to be an unfavorable prognostic sign, and in most cases it requires no special treatment. Occasionally there is a considerable amount of albumen in the urine in cases which are not severe, and the quantity in the same patient may vary from day to day. In some grave cases of diphtheria the urine is scanty, and there is then danger of uræmic poisoning. If there is great and continued deficiency, death may occur from this cause in convulsions and coma.

The course of diphtheria, like the intensity of its symptoms varies greatly in different cases, whether the result be favorable or unfavorable. Complete recovery may occur within a few days, less indeed than a week, but in other and perhaps a majority of favorable cases weeks elapse before the health is completely restored. When the disease is so protracted, the pseudo-membrane is detached slowly, or being detached, it is reproduced again and again. In these lingering cases, the countenance bears the appearance of marked cachexia, the appetite remai s poor or capricious, the features are pallid, the body more or
reduced. Convalescence of such
even after the inflammation has e

The course of diphtheria lac

favorable cases. I have known death to occur in a robust child of two years and three months on the fourth day, without cough, and entirely from the malignant nature of the affection. The strength was overpowered, and life so suddenly extinguished by the intensity of the diphtheritic virus. In this case there was great external swelling and intense pharyngitis. In other cases, as has been previously stated, death occurs from diphtheritic croup. In other, and a large proportion of fatal cases, the disease is more protracted. Without embarrassment of respiration, and often apparently with but moderate inflammation, the patient gradually loses flesh and strength. The face presents a pallid and cachectic aspect, and sometimes there is a general flabby or œdematous appearance; the appetite is poor, and is improved but little by tonics; the pulse is accelerated, and is day by day more feeble, till, finally, death occurs from asthenia. In these lingering and dubious cases, all hope of recovery is sometimes dissipated by the occurrence of abundant hemorrhage from the throat, in consequence of detachment of the pseudo-membrane and consequent rupture of the capillaries, or possibly sometimes from ulcers in the throat. I was once treating a little girl about nine years old with diphtheria accompanied by pretty severe pharyngitis, and she had entered the third week, with prospect of a favorable issue of the disease, when she was suddenly seized with profuse hemorrhage from the fauces, which was repeated, and death occurred in forty-eight hours. So unexpected a result was apparently due to separation of the false membrane.

NATURE.—Though the inflammatory lesions in diphtheria are so severe and dangerous, they sustain a secondary relation to the disease itself. Diphtheria must be placed in the same category with smallpox, scarlet fever, measles, and other infectious diseases. Like them, it is due to a specific virus. These diseases, though dissimilar in nature and appearance, are controlled by the same general laws, so that they are very similar as regards the mode of their occurrence. That there is a miasm generated in the persons of those affected, and which propagates the disease, is shown by numerous observations. The infectious nature of diphtheria is, however, doubted by some, though admitted by most pathologists. Facts such as those which prove the communicability of scarlet fever and measles, have been repeatedly observed in reference to diphtheria. Diphtheria, if it enters a family of children during its epidemic prevalence, usually attacks more than one. It attacks those who remain in the same room with a diphtheritic patient, while those staying in separate apartments escape. In the late epidemic of diphtheria in this city, I was asked to see a boy about ten years old with diphtheria. The father had left home a few days previously, and escaped the disease. A servant girl, who was much frightened and remained in a distant part of the house, also escaped. Three sisters, who were daily exposed to the boy, took the disease within the ensuing week, in a mild form. All had the pseudo-membrane, though of limited extent. Such facts, and there are many of a similar nature contained in the literature of diphtheria, establish the doctrine of the communicability of this disease as securely as almost any doctrine in pathology.

It is not known certainly whether diphtheria is inoculable, but it is believed by many that the saliva and pseudo-membrane of a diphtheritic patient, applied to the abraded cutaneous surface or to the mucous membrane, may communicate the disease. The illustrious Valleix, whose writings hold so conspicuous a place in the literature of children's diseases, was attending a child with diphtheria. One day, on examining the throat of his patient, he received in his mouth a little of the saliva, ejected in the effort of coughing. The next day a small concretion appeared on one tonsil. The inflammation and the pseudo-membrane extended, and in forty-eight hours Valleix died, though his patient recovered. This case and others similar to it, which have been published, do not prove the inoculability of diphtheria, for the same result might have occurred in the ordinary mode in which contagious diseases are transmitted, namely, by infection. But as all who have seen much of diphtheria, from the time of Bretonneau, have now and then observed cases analogous to that of Valleix, it is the part of prudence, till the question of inoculability is settled, to avoid all needless exposure. Bretonneau believed not only in the inoculability, but that this was the only way in which diphtheria is communicated.

Diphtheria also, like typhus fever, often occurs without exposure. Whenever it visits a region, it commences in localities remote from each other, some of which are so secluded as to negative the idea of importation. For example, in this country as well as in Great Britain, during the recent epidemic, it prevailed in remote farming sections as early and sometimes earlier than in the commercial centres. Children who had lived for months secluded in farmhouses were sometimes the first to be affected.

Infectious diseases have a period of incubation. Observations show that this is short in diphtheria, though, as in scarlet fever, it seems to vary in different cases. This period is usually from two to seven days.

Diphtheria, whatever the local manifestations, is always essentially the same disease. A mild may communicate a severe form, and *vice versâ*, and cases, which at first view might appear to be different on account of difference in the seat of the phlegmasia, are shown to be identical in nature by occurring together, and in consequence of the same exposure.

Allusions have already been made to the epidemic character of diphtheria. Sporadic cases occasionally occur. The epidemic form is more severe and fatal than the sporadic. The history of the various epidemics shows the universality of the specific virus, for diphtheria has prevailed in all seasons, in all or nearly all climates, in the rural districts, remote and sparsely settled, as well as in cities, and in mountainous regions as well as in valleys. It is, however, most prevalent and fatal where anti-hygienic conditions prevail, as in the tenement-houses of the city, and especially in such apartments as are dark and damp, but which necessity compels the poor to occupy. A large proportion of the severe cases seen by myself, during the recent epidemic in New York, occurred in the upper part of the city, along the old watercourses, where, in consequence of grading of the streets, there was more or less stagnant water, which was impregnated with decaying animal and vegetable matter. In these localities, even where the population was sparse, some of the first as well as last cases of the epidemic occurred, and a large portion of those affected died.

Diphtheria occurs at any age. I have known the infant of three months die of it, and many adults fall victims when it prevails as an epidemic. Much the largest number of cases, however, occur between the ages of two years and eight or ten. The occurrence of this disease at so early an age as three months, and, on the other hand, in adult life, affords one point of contrast between diphtheria and scarlet fever, as well as true croup, both which rarely occur at so early and so advanced an age.

SEQUELÆ.—Those who recover from a severe attack of diphtheria, remain often for weeks with a pale and cachectic appearance. The blood is evidently profoundly altered, so that there is a deficiency of red corpuscles or a state of spanæmia, which slowly disappears. This is a common result of protracted constitutional diseases, but it is more noticeable after this than most kindred affections. The excretion of albumen from the kidneys no doubt increases materially the impoverishment of the blood.

There is another sequel, which possesses great interest, as it is common in diphtheria, and as its etiology is not fully understood. This sequel is paralysis. Paralysis does not occur till after the abatement of the inflammatory symptoms. The patient seems fully convalescent. The fever has ceased; the appetite is returning; the anæmia is becoming less, and there is prospect of speedy restoration to health, when this nervous affection is developed. The interval between the subsidence of the inflammation and the commencement of the paralysis is usually two or three weeks. The muscles most frequently affected are those of the pharynx, so that deglutition is rendered difficult, to such a degree often, that nutrition is seriously interfered with. The aliment taken passes back through the nostrils, or is not swallowed till after several successive efforts. In the attempt to swallow, a portion of the food sometimes enters the larynx, so as to produce violent coughing. As we observe the dysphagia, it seems as if there must be pharyngitis, which renders deglutition difficult, but on inspecting the fauces we find no evidences of inflammation. The mucous membrane has recovered its normal appearance, and the nerves only are affected. The velum palati hangs flaccid and motionless, like a curtain. In some there is only pharyngeal paralysis, but in many this nervous affection occurs in other parts. Whenever it occurs elsewhere, the pharyngeal muscles are nearly always involved at the same time. Diphtheritic paralysis may affect the motor muscles of the eye, causing strabismus; the muscles of one side, causing hemiplegia; of the legs, causing paraplegia; or of an arm on one side and leg on the opposite. It does not commence simultaneously in the various muscles which are affected, but in succession, those first affected being for the most part the muscles of the pharynx. In some the muscles of the bladder have been paralyzed, leading to retention of urine or difficulty in passing it. Paralysis in the limbs is frequently preceded by tingling or a sensation of formication. There is often not a total loss of sensation or of motion in the paralyzed part, but there is numbness with great difficulty rather than impossibility of motion. A few cases have been reported in which the paralysis was almost general, and some believe that they have met cases in which the heart was paralyzed, death occurring suddenly and unexpectedly. Dr. J. B. Reynolds relates a case in the *New York Journ. of Med.*, May, 1860, in which there was not only [illegible]
of the limbs, and paralysis of the m
food was regurgitated, but the hea
chin rested on the sternum.

A majority of those affected with paralysis recover, although few regain the complete use of their muscles in less than one month, and many do not till between two and four months.

Defect of vision is an occasional result of diphtheria; some have presbyopia; others myopia; some see double; some are amaurotic; while in others one pupil is more dilated than the other, or both pupils are dilated, and feebly sensitive to light. This impairment or perversion of vision gradually disappears as the vigor of system returns.

PROGNOSIS.—The prognosis in diphtheria is more favorable when it occurs sporadically, or at the close of an epidemic, than when the epidemic influence is prevailing. Though a constitutional disease, its gravity is in a majority of cases proportionate to the local symptoms. Therefore, intense pharyngitis, an extensive pseudo-membrane, and great cervical cellulitis and adenitis, indicate a form of the disease which usually proves fatal in the robust as well as weakly. When the inflammation extends to the larynx, and the phenomena of croup arise, there is slight prospect of recovery. Pseudo-membranous laryngitis is then present in addition to the depressing influence of the diphtheritic virus. The local disease, apart from the constitutional, we know to be ordinarily fatal. Much more unfavorable, then, is the prognosis if the two are combined. When the croupy cough, voice, and respiration are observed, he will seldom err who predicts a fatal result within a week, and often death follows in two or three days.

Great acceleration of the pulse continuing after the first week, a countenance pallid, with softness or flabbiness of the tissues, the occurrence of hemorrhage from the fauces or other parts, are prognostic of an unfavorable ending. The secondary form of diphtheria is more apt to prove fatal than the primary, in consequence of the depressing effect of the antecedent disease.

From what has already been stated, it is obviously injudicious to predict a favorable or an unfavorable termination from the character of the initial symptoms, since an obstinate and fatal case often commences mildly, and cases easily managed may commence with violent symptoms. But if the inflammations, mucous and glandular, remain of a mild grade, if the pulse is not greatly accelerated, if the constitution is good, and there are no laryngeal symptoms, a good result is highly probable.

In many cases, after the active symptoms have somewhat abated, the result for days or even weeks is uncertain on account of the anæmia. A majority, however, who have passed through diphtheria, recover, even if there is great impoverishment of the blood, provided that there are no serious local symptoms. Diphtheritic paralysis, which is so alarming to friends, may continue several months, but it is very seldom permanent, perhaps never. Only in exceptional instances do patients affected with it die. This result is probably due in general to imperfect nutrition, resulting directly from the diphtheria, or from the dysphagia, which is present in consequence of the paralysis.

DIAGNOSIS.—The liability of mistaking simple pharyngitis, when attended by the growth of confervæ, for diphtheria, has been already sufficiently pointed out. By the microscope the diagnosis in such cases is rendered easy. The greater amount of external swelling in pseudo-membranous pharyngitis is also a means of distinguishing this disease from the simple form. There is, in some cases, a close resemblance of diphtheria to scarlet fever, especially as regards the condition of the system generally, the pharyngitis, and the external glandular swelling. The rash upon the skin, and the absence of a pseudo-membrane upon the fauces, in scarlet fever, are usually sufficient to establish the diagnosis. In almost all cases of diphtheria, this pseudo-membrane can be seen on inspecting the fauces. The cases in which it is not visible, during the active period of the disease, are so few that no account need be taken of them. The superficial gangrenous state of the throat, occasionally present in scarlet fever, can be distinguished by careful examination from the pseudo-membranous pharyngitis of diphtheria. Occasionally anginose scarlet fever is attended by a fibrinous exudation, especially upon the tonsils, but the quantity is small, unless, indeed, there is at the same time diphtheria. Practically, however, it matters little whether we make a differential diagnosis of scarlet fever and diphtheria, as the two require very similar therapeutic measures.

Diphtheria, with the pseudo-membranous laryngitis, and true croup, present great similarity as regards symptoms. One has often been mistaken for the other, to the detriment of the patient, for these two diseases require different treatment. With proper care, however, in examination, with a knowledge of the history of the case, the character of the affection can generally be ascertained. The inflammation of croup generally begins in the larynx, and the pharynx, though inflamed, is inflamed secondarily; whereas the inflammation of diphtheria begins in the pharynx, the laryngitis occurring some days later. Therefore, in diphtheria there is usually the fever, with tenderness and tumefaction of the faucial surface, and fibrinous exudation, before the cough or other symptoms of laryngitis occur. In croup the characteristic voice and cough are present from the first, and if we inspect the fauces in the commencement of the disease, we find only a degree of redness, and though at a later period points or patches of pseudo-membrane may be observed, the inflammation of the pharynx remains less intense throughout the disease than that of the larynx, as shown by the symptoms. The pseudo-membrane of diphtheria penetrates the mucous coat, and is fibrinous; while that of croup lies on the surface, and consists chiefly, if not entirely, of degenerated epithelial cells, with mucus and pus. By attending to these particulars, a correct diagnosis of croup and diphtheria can ordinarily be made.

TREATMENT.—It has been proposed, in the treatment of this and other infectious diseases, to give medicines to prevent the supposed fermentative processes going on in the economy, and by this means to ameliorate, if not entirely control, the morbid action. Prof. Polli, of Milan, has recommended for this purpose the use of the sulphites, in the belief that the sulphurous acid set free in the system by their decomposition, prevents, or tends to prevent, catalysis. Experiments have shown that this agent does check fermentation without the system, and the theory of Polli possesses a degree of plausibility. But in such matters the only reliable guide is experience. The doctrine of catalysis in disease is indeed merely, as yet, an hypothesis, having the appearance of correctness. If experience show that the sulphites are beneficial in the treatment of the so-called zymotic affections, we are then, and only then, justified in employing them. In our present imperfect knowledge of pathology and of the action of medicines, theorizing should succeed observation. It is difficult to determine the exact value of any medicine in the treatment of zymotic diseases, since so many cases terminate favorably without medicines, but some of the physicians of this city who have used the sulphites speak favorably of their effect. My own experience with them has been limited. I have seen improvement in severe scarlet fever when these agents were employed, but remained in doubt whether the same result would not have followed with the use of other measures. The most eligible of the sulphites is the bisulphite of soda, since this gives a large amount of sulphurous acid, has no purgative effect, like some of the sulphites, or other injurious action, and, from its name, insures against any mistake on the part of the druggist. The word sulphite has been mistaken in a prescription for sulphate, the error not being detected till the child was weakened by purgation. Bisulphite of soda is readily soluble in water as well as alcohol, and to a child of three to five years one to two drachms may be given in twenty-four hours, in doses of five to ten grains.

℞. Sodæ bisulphit. ʒj–ij;
Tinct. aurant. ʒij;
Aquæ ℥x. Misce.

Dose, one teaspoonful every two hours. Sometimes in place of water a bitter infusion like that of quassia has been employed.

Death in diphtheria, as we have seen, ordinarily occurs from exhaustion or from obstructed respiration. Knowledge of this fact aids in the choice of therapeutic measures. Diphtheria is decidedly an asthenic disease; therefore sustaining treatment is required. From the first, although the pulse is strong, the surface hot, and features flushed, all measures of a depressing nature must be carefully avoided. Great febrile excitement, in connection with robustness of system, may incline us to the use of cardiac sedatives, but they should not be administered, or if administered, only the mildest should be given and with caution, since diphtheria, if it continue a few days, is attended by evident symptoms of prostration, whatever the mode of commencement. Nutritious food, like the animal broths, should be given often and in a concentrated form, on account of the difficulty of swallowing, and recourse should be had to alcoholic stimulants, as wine-whey or milk-punch, as soon as there are any indications of feebleness. An extensive pseudomembrane and great glandular swelling show a form of the disease which requires immediate and active sustaining measures. The apartment occupied by the patient should be kept clean and dry, as indeed it should be in the treatment of any infectious disease. A change of apartments during the day is also advisable, particularly in those cases in which there is a gangrenous odor.

As the sulphites have not been employed sufficiently long to determine their value, or whether, indeed, they have any effect in controlling diphtheria, it does not seem judicious until they are more fully tested, and are found to accomplish what is claimed for them on theoretical grounds, to discard, in cases that are at all critical, those remedies which appear to be indicated from the nature of the disease, and which have met general approval of the profession. These remedies are the tonics, vegetable and ferruginous.

A large number of these medicinal agents might be mentioned, all of which would be likely to result in more or less

I will only mention such combinations as are well adapted to meet the various indications.

Chlorate of potash or soda, and tincture of the chloride of iron, are the two remedies which have been most employed in this country and in Europe, on account of their supposed local effect on the inflamed surface, and the latter on account of its eminently tonic properties. Prescribed in combination, these medicines are not unpleasant to the taste, and I consider this mixture one of the very best for ordinary cases of diphtheria:—

℞. Tinct. ferri chloridi ʒj;
Potas. chlorat. ʒj;
Syr. simplic. ℥ij. Misce.
Dose, one teaspoonful every two or three hours to a child of three years.

I have usually given directions to allow no drinks to the patient for a few minutes after each dose, in order that the full local effect may be obtained. The tincture of the chloride of iron alone, the wine of iron, or any of the other ferruginous preparations, may be advantageously administered, especially in anæmic cases, in place of the mixture mentioned above. In those of full habit and florid complexion, iron is not so imperatively required. In such cases the elixir of Calisaya bark, in doses of one teaspoonful to a tablespoonful, according to the age, is a useful and not unpleasant remedy. The fluid extract of cinchona or columbo also meets the indication.

There is difference of opinion as regards the value of local treatment in diphtheria. Some hold that as it is a constitutional malady, and that as death in it is ordinarily due either to exhaustion or to inflammation of the larynx, which we cannot subject to any reliable local treatment, therefore topical measures directed to the throat, which worry and fatigue the child, are not advisable. But, as Trousseau has remarked, the gravity of diphtheria is usually proportionate to the amount of local disease, and if, therefore, we can moderate the intensity of the inflammation, we increase the chances of a favorable issue. The local disease reacts on and intensifies the constitutional, increasing the febrile movement, and exhausting the strength of the patient. Again, it is probable, though this opinion is not held by some, that the laryngitis of diphtheria often results from extension downward of the faucial inflammation.

For these reasons, direct treatment calculated to diminish the intensity of the faucial inflammation is proper, and yet those severe caustic applications, formerly much employed, and still used by some practitioners, by causing great pain and restlessness, weaken the child, and do more harm than good. Great gentleness on the part of the physician, in making applications to the throat, cannot be too strongly insisted on. Harshness towards a patient is always to be condemned, and in no disease more than in this. By gentleness and a little tact, much of the repugnance to the operation, on the part of friends, may be prevented.

The formulæ recommended in the topical treatment of the larynx in croup are proper for the pharynx as well as larynx in diphtheria. For these formulæ the reader is referred to the article on croup. The tincture of the chloride of iron has been advantageously prescribed as a gargle with chlorate of potash in those old enough to employ such treatment. For this purpose a drachm of the tincture should be added to a tablespoonful of a saturated solution of chlorate of potash, and gargled every hour or two. I prefer, however, a gargle consisting of carbolic acid, six or eight drops to one ounce of solution of chlorate of potassa, particularly if there is decomposition of the pseudo-membrane and an offensive odor. The local treatment should, of course, vary according to the extent and character of the inflammation. When the pseudo-membrane is removed, and the inflammation has begun to abate, there is less need of active topical measures. They should soon be discontinued.

When croupy cough is observed in diphtheria, it is well to administer, if the patient is robust, an emetic which causes the least possible prostration. The sulphate of copper or of zinc is one of the best emetics of this class. At the same time general sustaining treatment is required. Quinine is given by many practitioners when croup supervenes, in sufficient quantity to reduce the frequency of the pulse. A child from three to five years old may take a grain every two hours. I know no better medicine for such cases, though, unfortunately, with this or any other treatment, a large proportion die. Moisture in the apartment is desirable, as in the treatment of true croup. If the laryngeal symptoms continue to increase, and the respiration becomes so embarrassed that lividity occurs, the propriety of tracheotomy becomes a serious consideration. It is only in exceptional cases that it saves life, but it renders death more easy.

If the patient has passed through diphtheria, and entered upon convalescence, attention should be given to his hygienic condition, and often therapeutic measures of a tonic character are still required. That most interesting and important of the sequelæ, namely, paralysis, gradually abates, without special treatment, as the tone of the system is restored. Strychnine may be given or the galvano-electric current employed, as a means of expediting recovery. The following will be found a good formula for those affected with paralysis:—

℞. Strychniæ gr. j;
Acid. phosphor. dilut. ʒij;
Syr. zingib. ʒvj. Misce.

Dose, three to five drops in a dessertspoonful of water three times daily to a child of three years.

The anæmic state which succeeds diphtheria requires the use of iron for several weeks.

CHAPTER II.

PERTUSSIS.

PERTUSSIS, or hooping-cough, is a contagious disease. It is manifested by inflammation of the mucous membrane of the air-passages, and a spasmodic cough to which this inflammation gives rise. It is due to a specific cause, a *materies morbi*, the exact nature of which is not known. It may occur both in the epidemic and sporadic form. It is probably not inoculable, although it is highly infectious, either through the breath of the patient, or by exhalations from his surface. With rare exceptions, it affects the same individual but once. Rilliet and Barthez report a case of its second occurrence, and a case is also reported by Dr. West. I have never attended a patient in two attacks, though I can recall to mind two individuals, both women of intelligence, who stated that they had previous attacks in early life. It occasionally affects young infants, even those less than one month old; and, on the other hand, adults, and rarely even old people; but most cases are between the ages of one and seven years.

SYMPTOMS.—Pertussis consists of three stages: first, the catarrhal; secondly, the stage of spasmodic cough—or, for brevity, the spasmodic stage; thirdly, the stage of decline.

The first period is characterized by the symptoms of coryza and bronchitis. The eyes present a moderately suffused and injected appearance. There is sneezing, with defluxion from the nostrils; and there is also more or less cough, dependent on bronchitic inflammation. The cough does not differ in character from that in the first stages of simple bronchitis, and there is little or no expectoration. Trousseau has known the cough to be repeated forty or fifty times per minute; but such great frequency is rare. The pulse and respiration are moderately accelerated, and such other symptoms as commonly accompany inflammatory affections of a mild grade are present, namely, increased heat of surface, thirst, and impaired appetite.

The duration of the first stage is various. It may, in rare instances, last only two or three days; or, on the other hand, be protracted even to six weeks. Its ordinary duration is from eight to fifteen days. In fifty-five cases observed by Dr. West, its average duration was twelve days and seven-tenths of a day. I have met two cases, both girls over the age of six years, in whom no spasmodic cough was noticed. If there was any, it was limited to a few paroxysms, and it might, therefore, be said that there was but one stage, namely, the catarrhal. They had the symptoms of the catarrhal stage, but instead of the occurrence of the spasmodic cough at the usual period, the inflammatory symptoms abated somewhat, and there remained an occasional easy cough, like that of simple subacute bronchitis. This continued during a period which corresponded with the duration of pertussis. The diagnosis in these cases would have been doubtful, except for the simultaneous occurrence of pertussis, with its regular stages, in other children of the same families.

SECOND PERIOD.—This supervenes gradually. At first, while the cough ordinarily has the character presented in the first stage, it is now and then observed to be more severe and spasmodic. The spasmodic element increases gradually, so that in the course of a week all doubt as to the nature of the disease, if any previously existed, is removed.

The severity of the cough in the second stage varies considerably in different cases. It sometimes occurs quite abruptly, but commonly there is premonition of it. The patient endeavors to repress it. If a child, he leaves his playthings, and rests his head on his mother's lap, or takes hold of some firm object for support; his face has a grave or even anxious appearance, while the pulse and respiration are somewhat accelerated. Immediately the cough commences. It consists in a succession of short and hurried expirations, which expel a large part of the air contained in the lungs, followed by a rapid and deep inspiration. There may be a single series of expirations, terminating in the manner mentioned; but often there are two, three, or more such series embraced in a paroxysm. The paroxysm commonly ends in the expulsion of frothy mucus from the bronchial tubes, and sometimes in vomiting. The rapid passage of air through the glottis, in the inspiration which terminates the cough, is sometimes accompanied by a sound, which is called the hoop. During the cough there is temporary arrest of blood in the lungs, leading to congestion in the right cavities of the heart and throughout the systemic circulation; therefore the face is flushed and swollen, and occasionally hemorrhage occurs under the conjunctiva, or from one of the mucous surfaces. The most frequent hemorrhage is epistaxis. When the cough ceases, and normal respiration is restored, the fulness of the vessels immediately abates; but often puffiness of the features is observed, due to serous infiltration of the subcutaneous cellular tissue, and continuing for days or weeks during the period when the cough is most severe.

The paroxysm lasts from a quarter to a half or even a whole minute, and in that time, in severe cases, there are often as many as fifteen to twenty series of expirations. The hoop is not as loud in infants as in children, and in young infants, especially those under the age of six months, it is often lacking, although the cough may be severe.

At the close of the paroxysm, if there is no complication, the symptoms soon abate; the temperature, pulse, and respiration become normal, and there is no evidence of disease. The cough in the second stage is much more frequent in one case than another. At the height of this stage it is generally more severe if it occurs at long intervals than when frequent. During the weeks in which pertussis is most severe there is, in the average, about one paroxysm of coughing to each hour.

The cough increases in severity till the third week of the second stage, or the thirtieth to thirty-fifth day of the disease, after which it remains stationary for a certain time. It is apt to be more frequent in the night than daytime. Sometimes it occurs while the child is quiet; it may even awaken him from sleep, but it is often also produced by mental excitement or by physical exertion. Anger or fright gives rise to it, and therefore the child is apt to cough when being examined by the physician, or when his wishes are not complied with. The ordinary duration of the second stage is from thirty to sixty days. It may, however, be considerably longer or shorter than this.

The third stage, which commences at the time when the spasmodic cough begins to abate, is short, not continuing longer than two or three weeks. A protracted stage of decline indicates some complication. While the sputum in the second stage is mucous and frothy, that in the third stage is more opaque and puriform.

In the third as in the second stage, if there is no complication, the pulse and respiration in the intervals of the paroxysms are nearly or quite natural. Febrile excitement may, however, now and then occur from trifling causes, or, indeed, without any apparent cause. The digestion and the general health in uncomplicated pertussis remain unimpaired, with the exception of more or less emaciation, which is apt to occur in all but the mildest cases, in consequence of the frequent vomiting. After complete recovery, it is not unusual for the spasmodic cough to reappear, at times, for one or even two years. The cough of ordinary simple laryngitis, or bronchitis, assumes this character.

COMPLICATIONS.—These, like the symptoms, are chiefly of a twofold character, namely, inflammatory and neuropathic. From the nature of the cough in this disease, it would naturally be supposed that the spasmodic affection, which is now designated internal convulsions, and which is characterized by spasm of certain muscles of respiration, would be a frequent complication. It does sometimes occur in young children, but it is not common. Clonic convulsions affecting the external muscles are, on the other hand, not infrequent. They occur chiefly in the second stage, when the cough is most severe, and in infancy much more frequently than in childhood. They are apt to be general and severe, or, if not of this character at first, to become such. The convulsions commence, in most instances, in or directly after the paroxysm of coughing; but they sometimes occur in the interval when the child is quiet.

Rilliet and Barthez remark: "Almost all infants succumb to this complication, ordinarily in the twenty-four hours which follow the first attack; nevertheless, life may be prolonged during two or three days" (Article *Coqueluche*). In my own practice this complication of hooping-cough has usually terminated fatally, but I have known recovery to occur somewhat unexpectedly under the use of bromide of potassium. In the month of June, 1867, I was attending a little girl two years and four months old, who had reached the fifth week of pertussis, when she was seized with general clonic convulsions. The mother, who was requested to keep a record of the number of convulsions, stated that there were twenty in all, occurring within forty-eight hours. They affected both sides, the shortest lasting only three or four minutes, the longest seventy-five minutes. The treatment in this case, which eventuated favorably, will be noticed hereafter.

In those who die of convulsions occurring in hooping-cough, the most constant lesion is congestion of the cerebral veins and sinuses, often with transudation of serum. This congestion is due in part to the cough which precedes the convulsions, and in part to the convulsions themselves. At the autopsies which I have made of two infants, who died in hospital practice from hooping-cough, accompanied by convulsions, all the cerebral sinuses were filled with clots, which were generally soft and dark; but in the lateral sinuses clots were found, which were light-colored. The light color of a clot, either in a vein or sinus, indicates its ante-mortem formation.

The gravity of the convulsive attack can be ascertained by observing whether the patient readily recovers consciousness. Its return indicates that there is no serious congestion. On the other hand, great drowsiness remaining, or a sèmi-comatose state, indicates persistent congestion, and perhaps even the formation of clots in the sinuses of the brain. Death from convulsions is usually preceded by coma. Occasionally meningeal apoplexy supervenes upon the congestion, and death is immediate.

The most frequent inflammatory complications are bronchitis and pneumonitis. Inflammation of the larger bronchial tubes, we have seen, is a common accompaniment of pertussis, but when it extends to the minuter tubes, or becomes so severe as to cause acceleration of respiration, it is, properly, a complication. Both bronchitis and pneumonitis, occurring as complications, are developed, with few exceptions, in the second stage. Bronchitis is accompanied by accelerated respiration and pulse, and increased temperature. The danger is proportionate to the amount of dyspnœa.

Pneumonitis is a less common complication than bronchitis, but it occurs more frequently in pertussis than in any other constitutional affection of early life, excepting measles. The congestion, which occurs and remains in the lung when the cough is frequent and severe, favors the development of pneumonia. The symptoms and physical signs which accompany this inflammation and serve for its diagnosis are the same as in the primary form of the disease, and are described elsewhere. Bronchitis or pneumonia usually moderates the severity of the spasmodic cough, for when the inflammatory element in pertussis increases, the spasmodic abates. On the abatement of the inflammation, however, the cough usually regains its former convulsive character. The fact may be stated in this connection, that any complication or intercurrent disease, which is attended by decided febrile reaction, ordinarily renders the cough for the time less spasmodic.

The occurrence of bronchitis or pneumonia is shown by the elevated temperature, acceleration of pulse and respiration, short and frequent cough. These symptoms do not cease as long as the inflammation continues, whereas in uncomplicated pertussis the patient seems nearly or quite well between the coughs. In pneumonia the respiration is accompanied by the expiratory moan, and in both bronchitis and pneumonia there is more or less depression of the infra-mammary region during inspiration. These symptoms, in connection with the physical signs, render diagnosis in most instances easy. Although the general character of the cough is changed, a cough now and then occurs, even when the inflammation is pretty severe, sufficiently spasmodic to indicate the nature of the primary affection. Capillary bronchitis and pneumonia are always serious complications.

It is stated by certain writers that the spasmodic cough of pertussis occasionally gives rise to emphysema, and dilatation of the bronchial tubes. Rilliet and Barthez do not believe that these structural changes occur from such a cause, because the spasmodic character of the cough of pertussis pertains to expiration. Later observations, however, demonstrate that emphysema in certain cases does result from forcible expirations (Niemeyer and others). Emphysema is a common lesion in young and feeble infants, even when there is no history of any previous severe disease of the respiratory organs. I have found it one of the most common lesions in infants of feeble constitutions who die in the Infant's Hospital and Nursery and Child's Hospital of this city. The chief cause of the emphysema in these cases appears to be the impaired nutrition and change in the molecular condition of the tissues. The same condition arises in severe and protracted pertussis, in which the child becomes enfeebled and cachectic. If severe bronchitis arises, we have still another factor in the production of emphysema.

At the meeting of the New York Pathological Society, October 14th, 1868, I exhibited emphysematous lungs removed from an infant who died at the age of nineteen months, and at the commencement of the fourth week of pertussis. Death occurred from thrombosis in the lateral sinuses of the cranium, resulting from the severe spasmodic cough, clonic convulsions, and from feebleness of the circulation, as the infant was previously in a reduced state from chronic entero-colitis. At the autopsy the superior lobes of both lungs were found exsanguine, doughy to the feel, and enlarged so as to rise above the level of the other lobes. The resiliency of the elastic tissue of these lobes was evidently greatly impaired, and their air-cells in a state of over-distension. The other lobes were healthy, except that one of them was the seat of lobular pneumonia. In the history of this case it did not appear that there had been any pathological state affecting the respiratory system previously to the pertussis, so that the commencing emphysema was referable to this disease. The forcible and irregular respirations which accompany the cough of pertussis appear, therefore, sufficient for the production of emphysema in the infant.

I have occasionally met cases in which partial collapse of certain portions of the lungs had occurred, and the mechanism of the cough is such that this would be a more probable result than enlargement of either the tubes or air-cells. Collapse, like emphysema, may continue for weeks or months subsequently to pertussis, and then gradually disappear.

DIAGNOSIS.—During the period of invasion it is impossible to diagnosticate pertussis. Its nature can only be conjectured from a known exposure, or from the epidemic occurrence of the disease. In the second stage, which is characterized by the spasmodic cough, diagnosis is ordinarily easy, and often the parents are able to announce the nature of the disease when the physician is called. Still, a mistake is sometimes made: a spasmodic cough very similar to that of pertussis occasionally occurs in other maladies. Young infants with bronchitis frequently experience great difficulty in the expectoration of mucus, which collects in the air-passages and provokes a suffocative cough. The following facts will aid in making the diagnosis. Bronchitis, accompanied by a suffocative cough, is an acute disease, and the cough occurs at an early period, usually in the first week. It lacks the inspiratory sound or the hoop, and is associated with constantly accelerated respiration and well-marked febrile symptoms, dependent on the inflammation. Moreover, the cough is only occasionally suffocative, according to the amount of mucus in the tubes. The spasmodic cough of pertussis, on the other hand, is preceded by the stage of invasion. This cough occurs in the second stage, when the febrile symptoms have abated; if the disease is uncomplicated, it is accompanied by a hoop, and its ordinary character is spasmodic. Again, the suffocative cough of bronchitis rarely ends in vomiting, which has been seen to be so common in the cough of pertussis.

The only other disease with which there is much likelihood of confounding pertussis is bronchial phthisis. The points of differential diagnosis are the following; the one epidemic, and spreading by contagion; the other non-contagious, and isolated: the one embraced in three distinct stages, and much shorter; the other chronic, and presenting no stages, but commencing with mild non-febrile symptoms, and progressively becoming more severe: in the one an absence of symptoms in the intervals of the cough, provided there is no complication; in the other constant symptoms, such as are common in tubercular disease. The previous health, and the presence or absence of a tubercular cachexia, should be considered in determining the nature of the disease, and usually, in bronchial phthisis, the lungs are also affected, so that auscultation and percussion may furnish positive proof of the nature of the cough.

PROGNOSIS.—This is ordinarily favorable. Nearly all recover, unless some complication arises. In rare instances death may occur in or immediately after a paroxysm of coughing, in consequence of the rupture of cerebral capillaries, and the occurrence of apoplexy. Most fatal cases, however, are complicated with either clonic convulsions, bronchitis, pneumonia, or, in the summer season, entero-colitis, and death is due to the complication rather than the pertussis. It has been stated elsewhere that clonic convulsions render the prognosis unfavorable, but the case detailed above shows that some may recover. If the convulsion is succeeded by marked drowsiness, the prognosis is very unfavorable. It is probable that other convulsions will occur, ending in coma. Immediate recovery of consciousness shows a less dangerous form of convulsions, and one which, with proper treatment, may terminate favorably.

The danger in bronchitis and pneumonia depends on the extent of the inflammation, the amount of dyspnœa, the age and strength of the patient. Capillary bronchitis and pneumonia are always serious complications. They have been the cause of death in a large proportion of the fatal cases which I have attended. Pertussis sometimes is attended with so much emaciation and loss of strength, in consequence of the vomiting, that intercurrent diseases, which, in favorable states of the system, would probably end favorably, are very apt to prove fatal. In this city epidemics of the diarrhœal affections, so common among infants in the summer, are much more fatal if at the same time there is an epidemic of pertussis. In my practice, an infant affected at the same time with the "summer complaint" and hooping-cough has generally perished, unless removed to the country. If there is much emaciation and an hereditary tendency to tuberculosis, the prognosis is more unfavorable, on account of the probable occurrence of this disease.

TREATMENT.—In the catarrhal stage the treatment should be the same as in idiopathic catarrh. It should consist of mild counter-irritation to the chest. If there is much bronchitis, with accelerated breathing, the oil-silk jacket may be applied. Demulcent, laxative, and gentle expectorant mixtures are proper. Care should be taken to employ nothing which would reduce the strength, or in any way impair the general health.

Therapeutic measures are most beneficial in the second stage, or that of convulsive cough. Proper treatment may prevent or control complications, which arise chiefly in this stage, and may moderate the intensity of the cough. Many formulæ have been recommended for the treatment of pertussis, most of them containing some antispasmodic. Oxide of zinc, musk, assafœtida, valerian, cochineal, the anæsthetics, and many other medicinal agents, have been employed, and there are physicians with whom each of these has had its season of repute. The three medicines which are most in favor with the profession, both in this country and Europe, and properly so, are hydrocyanic acid, balladonna, and bromide of ammonium. The employment of the last of these is comparatively recent. The others are old remedies, and their therapeutic effects are more fully ascertained. In my opinion, the treatment by belladonna is usually most successful, and this agent is more employed than any other. Some of the belladonna of the shops, as is true likewise of hydrocyanic acid, is of inferior quality, either from its mode of preparation, or the manner in which it has been kept, and is therefore not reliable. But if good, and prescribed properly, it will ordinarily render the cough milder.

The first dose of belladonna should be smaller than will probably be required to ameliorate the disease. The child, however, requires a larger proportionate dose of belladonna than an adult to produce the same effect. Trousseau's great experience in the treatment of children's diseases, and his successful practice, render his views in reference to the employment of this agent deserving of careful consideration. For young children he directed pills to be made, each containing about one-tenth of a grain of extract of belladonna mixed with an equal quantity of the powder of the leaves of belladonna.

For children over the age of four years, the pills contained one-fifth of a grain of the extract and the same quantity of the powder. He directed that one of these pills should be taken in the morning when the stomach was empty, and a second on the following morning. The nurse marked on a card each paroxysm of coughing, so that the effect of the medicine could be ascertained. If the number of paroxysms was diminished, or the cough rendered less severe, so that there was evidently decided amelioration, the same dose was administered each day. If, on the other hand, there was no improvement in the number or severity of the paroxysms, two pills were given on the following morning, three on the next, and so on till an appreciable effect was produced. Trousseau considered it important to give at one dose whatever belladonna is administered during the day. The same quantity per day given in small doses, at intervals, he believed to be less effectual.

The dose which he found to produce amelioration of the symptoms he ordered to be repeated daily during the succeeding six or eight days. Then, if the improvement continued, the dose was gradually diminished by one pill each day, back to the first dose; but if the cough increased, the dose was again increased.

Finally, when the spasmodic cough had entirely ceased, Trousseau advised the continuance of the medicine six or eight days longer before its complete suspension.

Trousseau sometimes employed atropine in place of belladonna, since the medicinal properties of the plant reside in this alkaloid, and, being crystalline, its strength is always uniform. He gave the neutral sulphate of atropia in dose of about $\frac{1}{174}$ part of a grain, dissolved in distilled water, to infants or young children, in the same manner as he prescribed belladonna. For older children he ordered a dose proportionately larger. Brown-Séquard, in remarks made before the United States Medical Association in May, 1866, maintained that the duration of pertussis, so far as the neuropathic element is concerned, might be abridged to a few days by doses of atropia sufficiently large to produce toxical effects. He recommends a dose which will cause, and repeated will maintain, delirium for three days; after which, he states, the cough is no longer spasmodic.

The older physicians who first advised the employment of belladonna in pertussis, as Schaeffer, Guersant, Goëlis, and Wendt, used it with caution, and in small or moderate doses, apparently believing that its use involved considerable danger. It is now, however, considered a safe as well as efficient remedy, and it is admitted that in pertussis the full benefit of the drug can only be obtained from doses which produce a decided impression on the system. If there is no amelioration of symptoms from smaller doses, it is proper to give it in a quantity which will cause dryness of the fauces and efflorescence upon the skin.

The tincture of belladonna is most convenient for use. The doses which I have found to be sufficient to modify the cough, at the same time producing efflorescence, are as follows: To a child of two years three drops, to one of six to eight years ten drops, morning and evening. I always commence, however, with a smaller dose, and continue to administer for a few days the dose which is found to produce the local effects alluded to. In the majority of cases I have noticed no decided effect till the rash was produced, when the symptoms improved, the cough becoming either less frequent or less severe. I have by means of this treatment been able to curtail the duration of the disease to four weeks from the beginning of the catarrhal stage, even when the paroxysms were unusually severe. The dose which proves sufficient to control the disease should be administered daily for a time, and then gradually diminished as the cough declines. Hydrocyanic acid possesses the power of controlling the spasmodic cough of pertussis. It is recommended by Dr. West. "I usually begin," says he, "with a dose of half a minim of the acid of the London Pharmacopœia (that of the U. S. Ph. is the same) every four hours for a child nine months old; and so in proportion for older children. The specific influence of the remedy is, I think, both more safely and efficiently exerted by increasing the frequency of its administration than by adding to the dose, and I should therefore prefer to give half a dose every two hours, rather than to double the dose without increasing the frequency of its repetition. This remedy sometimes exerts an almost magical influence on the cough, diminishing the frequency and severity of its paroxysms almost immediately; while in other cases it seems perfectly inert." Dr. West has employed this remedy several hundred times, and only once has observed alarming symptoms from its use. The patient was two and a half years old, and had been ordered one minim of the dilute acid every four hours. He took the acid for four days without any effect being produced, either on his system generally, or on the cough; but at the end of that time, after taking the dose, he uttered a cry, became quite faint, and would have fallen, if not supported.

Hydrocyanic acid, given in safe doses, does not appear to produce amelioration of symptoms in so large a proportion of cases as belladonna, and I do not know any advantages which it possesses over that agent. Belladonna never produces sudden alarming symptoms, like the acid. If, through mistake, more than the prescribed quantity is administered, it may cause delirium, and the characteristic effect on the mucous membrane of the fauces and upon the skin; but a gradual disappearance of these symptoms may be confidently expected, without any injury to the patient. Even poisonous doses, unless excessive, are rarely fatal. If for any reason it is thought best to prescribe hydrocyanic acid, the following formulæ from West may be employed:—

℞. Acid. hydrocy. dil. ♏iv;
Syrupi simplicis ʒj;
Aquæ destillat. ʒvij. M.

A teaspoonful to be taken every six hours by a child nine months old.

℞. Acid. hydrocy. dilut. ♏iv;
Mistur. amygdalæ ℥j. M.

Dose the same.

The bromides have, within a few years, been used in the treatment of pertussis. They were first recommended by Dr. Gibbs, and subsequently by Prof. Harley, of London. It is claimed for them that they produce an anæsthetic effect on the mucous membrane of the larynx. The bromide employed by the above and other physicians has commonly been that of ammonium, but some prescribe that of potassium, or the two in combination. Prof. Harley gives one grain of the bromide of ammonium for each year of the patient's age, three times daily; Dr. Gibbs gives two or three grains every eight hours to infants, and from four to ten grains to older children. Dr. Ritchie, physician to the Royal Edinburgh Hospital for Sick Children, says of it (*Edin. Med. Journ.*, June, 1864): "In my experience, the remedy appears to be most successful in children whose age exceeds two years. . . . The quantity I have generally given has been from three to twelve grains a day, in divided doses, administered every six hours. . . . Having used the preparation in upwards of twenty cases, if I may be allowed to express an opinion on this head, it would be that the great efficacy of the drug is in uncomplicated cases; that in those complicated with acute bronchitis, or pneumonia, the benefit is so trifling that I prefer other methods of treatment; for an acute congested condition of the air-passages appears to lessen the effect of the bromide as a laryngeal anæsthetic; that the more frequent the paroxysms of hooping, the more marked and rapid is the relief; that greater relief appears to be experienced in those of some continuance than in recent cases; and, lastly, that when chronic bronchitis is present, the bromide should not be given alone, but combined with squill and ipecacuanha mixture, and occasionally with an emetic."

I have employed the bromides, though not largely, in the treatment of pertussis, but have not, in ordinary cases, observed that benefit which I had been led to expect. In recent cases, belladonna is a much more efficient remedy. I would use the bromides chiefly in advanced cases, and in cases, whatever the period of pertussis, in which there seems to be imminent danger of clonic convulsions. In these last cases, the bromide of potassium, with or without that of ammonium, may, in certain cases, prevent the convulsive seizure. The hydrate of chloral has been employed for pertussis, in the children's class, in the out-door department at Bellevue. It produces prolonged sleep, and consequently diminishes the frequency of the cough as long as the narcotic effect lasts, otherwise it does not seem to exert any influence on the symptoms or progress of the disease.

There are many other remedies which have been vaunted in the treatment of pertussis, and which do moderate the severity of the cough. Some, it seems to me, have this effect by producing febrile excitement. Such is the use of cantharides, so as to produce active congestion of the urinary passages and strangury; severe counter-irritation over the chest by tartar emetic, namely, Autenrieth's treatment, etc. Emetics have sometimes been prescribed in the first stage of pertussis, in the belief that they moderated the severity of the disease. They are more frequently employed on the Continent than in this country. Laennec says: "Not any measure is more useful in the commencement of pertussis than vomiting, repeated every day or every two days, during one or two weeks." Some physicians have given for this purpose ipecacuanha, and others sulphate of zinc. Trousseau employed sulphate of copper. The loss of strength, however, which necessarily attends the employment of emetics, even the mildest, more than counterbalances any good effect of their use, except when there is considerable accumulation of mucus in the tubes, which an emetic assists in expelling.

A remedy long in use, and still a favorite with many families, consists of half a scruple of cochineal, one scruple of carbonate of potassa, one drachm of sugar, and four ounces of water. The dose for a child one year old is a dessertspoonful three times daily; for older children the dose is increased in a corresponding degree. It is believed by some that the cochineal is inert, and that the beneficial effect of the above mixture is due to the potassa, which modifies the accompanying bronchitis.

Alum, in doses of one to six grains, according to the age, is recommended by Dr. J. F. Meigs (*Treatise on Diseases of Children*). Inhalation of the fumes arising from the purification of gas, has been recommended in Paris as an effectual remedy in the declining stage of pertussis; but, on the other hand, it is alleged that the benefit is due to the out-door exercise required by this treatment. M. Roger employed these fumes in the wards of the Children's Hospital, Paris; but apparently without benefit. Nitric acid has also been used internally, and applications of nitrate of silver to the throat; both, it is stated, with improvement in certain cases. Change of air is always beneficial in advanced hooping-cough. In uncomplicated cases the child should be carried daily into the open air; but, on account of the inflammatory affection of the air-passages, should never be exposed to cold or wet, or sudden changes of temperature. For the same reason the temperature of the apartment should be moderately warm and uniform. Great benefit, as regards the severity of the cough, often accrues, especially in the advanced period of the disease, by removing the child to the country, or to another locality.

Severe bronchitis, or pneumonia, which often complicates pertussis, requires the treatment which is elsewhere recommended for the secondary form of this inflammation, namely, the use of the oil-silk jacket, poultices, counter-irritation, and, internally, carbonate of ammonia, with perhaps a tonic. As mild bronchitis is present from the commencement of the disease, the oil-silk jacket is useful even before the inflammation becomes so severe as to constitute a complication. Clonic convulsions, which we have seen are a common and very serious complication, should be treated by cold to the head, a warm foot-bath, and laxatives in certain cases. The medicine which, in my opinion, is most likely to control the spasmodic movements, is bromide of potassium. The mode of administering this agent will be sufficiently explained in our remarks relating to the treatment of eclampsia. In the case alluded to in the preceding pages, in which there were twenty convulsions within forty-eight hours, and the patient, two years and four months old, recovered, the bromide of potassium was given in combination with the iodide. The dose was about two grains of each every two or three hours.

CHAPTER V.

PAROTIDITIS.

ORDINARILY, parotiditis, or parotitis, or mumps, has no premonitory stage; but in exceptional cases, languor with fever precedes the disease for a few hours. Mumps commences with tenderness in the parotid region, followed soon after by tumefaction. The swelling gradually increases; it fills the depression under the ear, extends forward and upward upon the cheek, and downward to a greater or less extent upon the neck. It has been demonstrated in case of symptomatic parotiditis, and the same is probably true of the idiopathic disease, or mumps (Virchow), that the swelling is due to inflammation of the gland-ducts, and consequent œdema of the interstitial tissue. The inflammation is specific, due to a materies morbi in the blood, and hence its decline after a fixed period. It reaches its maximum from the third to the sixth day. The most prominent point at this time is immediately underneath the lobule of the ear. The tumor, which is firm but slightly elastic, presses outward the lobule. In most cases the skin preserves its normal appearance over the swelling, but occasionally it presents a faint blush. The pressure which movements of the jaw produce on the gland renders mastication and even talking painful. Febrile movement more or less intense occurs, lasting, in ordinary cases, not more than forty-eight hours, but occasionally it is more protracted. Vomiting and epistaxis are sometimes present. The swelling having attained its maximum size, remains stationary a short time, when it begins to decline, and by the sixth to tenth day it has entirely subsided.

In most cases parotiditis is double; it commences on one side, more frequently the left than right, and in from one to four days the opposite gland is involved. In those exceptional cases in which only one parotid is affected, the opposite gland may be the seat of the disease at some subsequent period. It has been estimated that the proportion of unilateral to double mumps is as one to ten.

The total duration of this disease is usually from eight to ten days; in the mildest cases it may not be more than five days. The submaxillary glands are often involved in connection with the parotids, and sometimes also the sublingual, although, from their small size and concealed position, their tumefaction escapes notice. Rarely the tonsils are also tumefied. Sometimes free perspiration occurs at the commencement of convalescence.

The swelling of the parotids sometimes abates suddenly, and in the male the testicle, epididymis, and tunica vaginalis become inflamed; while in the female, the mammary glands, ovaries, or the labia majora, are the seat of the so-called metastasis. Occasionally these inflammations, which are less frequent in young children than those near the age of puberty, when the sexual organs are becoming more developed, occur without subsidence of the parotid swelling. They cause considerable increase in the fever and constitutional disturbance, but with proper treatment decline in six to eight days, pursuing the same course as the parotid inflammation.

NATURE.—Parotiditis is contagious. It is rare in infancy and after the middle period of life, occurring chiefly in childhood, youth, and early manhood. An incubative period of about twelve days was ascertained by me in cases occurring in the Protestant Episcopal Orphan Asylum of this city. The observations of others give a similar result. Parotiditis is a blood disease, having the local manifestation described above, and which is our only means of diagnosis.

DIAGNOSIS.—If the physician has seen but few cases of mumps, there is danger that he may mistake the swelling for an inflamed cervical gland, or *vice versa*, but an inflamed cervical gland presents to the finger a hardness almost like that of cartilage, and it is circumscribed or round, and does not invest the ear. These characteristics contrast with the elasticity, seat, and shape of the parotid swelling, which extends forward on the cheek, and surrounds and elevates the lobule of the ear. Tumefaction resulting from diphtheritic or any other form of faucial inflammation, or from periostitis affecting the root of the posterior molar, may be detected by examining the fauces and interior of the mouth.

TREATMENT.—This is very simple. Oakum or carded wool may be bound over the swelling, and the surface occasionally rubbed with sweet oil. Mild laxative, and diaphoretic drinks, such as bitartrate of potash or lemonade, are useful. If metastasis occur, the new local affection should receive chief attention. It should be treated in the same manner as if it occurred independently of the mumps. The employment of irritants over the parotid in order to cause a return of the inflammation from the sexual organ to this gland, does not have the effect desired, and is injurious.

SECTION IV.

OTHER GENERAL DISEASES.

CHAPTER I.

INTERMITTENT FEVER.

INTERMITTENT fever is a constitutional disease, due to a specific cause emanating from the soil. It spares no age. Even infants of a few months are not exempt from it, and it is said that a pregnant woman affected with it occasionally observes a periodical tremor of the fœtus. Stokes, of Dublin, recorded such a case; and, according to Bouchut, cases have been observed in which new-born infants, whose mothers were affected, had not only the characteristic paroxysms, but also enlarged spleens, showing that intra-uterine life is not always shielded from the influence of the specific cause.

It is not fully ascertained whether a nursing infant may contract intermittent fever by lactation, but if it is admitted that it is sometimes communicated to the fœtus through the maternal circulation, it does not seem improbable that the specific principle occasionally enters the milk as well as other secretions. I have frequently remarked the presence of the disease in nursing infants whose mothers were affected, and in one instance an infant at the breast, whose mother had the ague, having contracted it in a suburban village, but was since living in a non-malarious part of the city, presented evident symptoms of the disease. Similar observations by Frank, Burdel, and others, do not indeed fully prove the communicability of intermittent fever by lactation, but render it highly probable.

No ascertained facts relating to intermittent fever in children throw any light upon the remarkable and much discussed observations and experiments of Prof. Salisbury, relating to the etiology of intermittent fever. Certainly, if the cause is a vegetable cell entering the blood through respiration, it sometimes adheres to it most tenaciously, and is probably reproduced in it, even under circumstances favorable for its elimination. Thus, at one of my cliniques at Bellevue Hospital Medical College in 1871, a child ten years old was presented, who had had every year for seven years attacks of intermittent fever. The disease was contracted at the age of three years in Harlem, and the subsequent residence of the family had been in a part of the city where there was no malaria.

SYMPTOMS.—In infancy, and especially prior to the age of eighteen months, the symptoms differ in certain respects from those which characterize the disease in the adult, and are universally known. In childhood the symptoms are similar to those in the adult, and need not, therefore, be described in this connection.

In the nursing infant the type is ordinarily quotidian, but now and then tertian. Advancing beyond the age of eighteen months, we meet more and more cases of the tertian type, and in childhood it is the common form. I have known the quotidian in the infant, when cured, to reappear a few weeks after as a tertian, but ordinarily it remains quotidian unless the patient has reached the age at which the tertian type predominates.

The paroxysm in the young infant presents three stages, as in the adult, but while the second, or febrile, is well marked, the first and third are much less pronounced. The patient does not shake (exceptionally one does even within the first year) in the first stage, but a slight tremor may or may not be observed. The countenance presents a sunken appearance; the lips and fingers are livid, while portions of the surface not livid are pallid, with the goose-flesh appearance, which is, however, less marked than in children of a more advanced age. The blood leaves the surface, which consequently shrinks, while it accumulates in the veins and internal organs; the pulse is feeble, and readily compressed; the surface grows cool from the diminished supply of blood, but the breath is warm, and the internal temperature, so far from being reduced, is elevated two or three degrees. The parents may be alarmed at the sudden sinking of the vital powers, and seek medical advice, but in other instances the first stage is so slight that it passes unperceived till they have been taught to watch for it, and the second stage first attracts attention.

In the second or febrile stage, which immediately succeeds, the pulse becomes full and rapid, 120 to 130 or 140 beats per minute, and the external as well as internal temperature is elevated as in few other diseases (104°–108°). The face is flushed, surface dry, and head painful, as evinced by the features. This stage lasts about two hours or somewhat longer. The third stage, or that of perspiration, succeeds, which terminates the suffering of the patient till the following paroxysm. In infancy the perspiration is not abundant, and in the first half of this period is nearly absent. In the interval of the paroxysms the patient appears well, except a degree of languor.

During the cold stage, passive congestion of the internal organs occurs to a greater or less extent, but the circulation is equalized during the reaction of the second stage. The spleen, whose capsule is distensible, soon enlarges in many patients, in consequence, probably, of the frequent congestions, constituting the "ague cake." This enlargement is more common in children than adults. Since my attention has been particularly directed to this subject, I have been able to feel the enlarged spleen, by examination through the abdominal walls, in about half of the cases under the age of ten years. The organ returns to the normal size after the ague is cured. From the intimate relation of the spleen to the composition of the blood, it is evident that the character of this fluid must be affected if intermittent fever be protracted. The blood becomes more and more impoverished, and a state of decided hydræmia supervenes. A few weeks' continuance of the ague suffices to produce decided pallor of the features, and surface generally, and as all watery blood is prone to transudation, such patients not infrequently present more or less œdema of the face, ankles, and other parts. Sometimes, also, especially under unfavorable hygienic circumstances, purpuric spots (purpura hæmorrhagica) appear under the skin, affording additional proof of the change which the blood has undergone.

Intermittent fever in children, if proper remedial measures are employed at an early period, is ordinarily not dangerous, and is quite amenable to treatment; but that comparatively infrequent and fatal form of it, designated the pernicious, occurs more frequently in children than adults. In New York city, where the type of malarial diseases is mild, I have never met a case of pernicious intermittent in the adult, but I can recall to mind such cases in children, two of them fatal. This form of the fever occurs in a smaller proportionate number of cases in infancy than in childhood, probably because the cold stage is less pronounced. In the pernicious ague, the system is overpowered—it does not react in a degree commensurate with the intensity of the disease. The patient enters the paroxysm, becomes stupid, and, if not relieved by prompt and efficient measures, enters into a fatal coma. A type of the disease, therefore, which would not be pernicious in a robust individual, may be such in one of a broken-down constitution and feeble reactive power. In most cases occurring in children the coma is preceded by eclampsia, which is apt to be general and protracted. A nice discrimination would no doubt exclude from the list of the pernicious affection certain of those cases in which coma succeeded clonic convulsions, for convulsions occurring from other causes frequently end in coma, and in all probability eclampsia complicating intermittent fever has, in many instances, additional and distinct causes quite as potent as the malarial poison or state. But practically this discrimination would subserve no useful purpose. It is better to consider as pernicious all those cases in which alarming prostration and stupor supervene in the paroxysm, requiring energetic measures to produce reaction and consciousness, whether convulsions have occurred or not.

Protracted intermittent fever in the adult occasionally produces waxy degeneration of organs, and also a greater or less amount of pigmentary matter in the blood (melanæmia). In children both these results are more rare.

TREATMENT.—The same mode of treatment is required for children as for adults, namely, the employment of the alkaline principles of cinchona. The sulphates of quinia and cinchonia are most frequently prescribed. From observations made in the class of children's diseases in the out-door department at Bellevue, two grains of the sulphate of quinia seem to have about the effect of three grains of the sulphate of cinchonia in the treatment of ague. They may be given in the same manner, both requiring an acid for solution, but it is impossible to disguise their intense bitterness. The vehicle which I prefer for their administration is the syrup of raspberry, which, though not officinal, is easily obtained. The following formula is for a child of three years:—

℞. Qui. sulphat. gr. xij.
Acid. sulphur. dilut. gtt. xviij.
Syr. rubi. idæi ℥jss. Misce.

One teaspoonful three times daily. The first dose should be administered immediately after the fever abates. In this climate two or three days suffice to cure the disease, after which one dose daily should be administered for a week, and then every second day for two or three weeks longer.

If any difficulty is experienced in administering the medicine on account of its bitterness, the dragées may be employed, if the child is old enough to swallow them, or the tannate of quinine.

The tannate may be administered by substituting tannic acid for the sulphuric. One grain of tannic acid is sufficient to form a tannate with four grains of the sulphate of quiniæ. The tannate, however, is not as reliable as the sulphate, and it is necessary to administer it in a somewhat larger dose.

CHAPTER II.

REMITTENT FEVER.

If a physician were to consult the standard treatises on diseases of children in order to ascertain the nature of remittent fever, he would rise from the perusal with no clear idea of it. One tells us that the remittent fever of children is identical with typhoid fever of adults; another, that it is a gastro-intestinal inflammation; and, finally, Hillier believes that there is properly no such disease, and that the term should be dropped from the nosology of children. There is, however, a remittent fever of children as well as adults, and much of the confusion which exists in reference to it arises from the fact that writers have not kept in view what constitutes a fever.

Febrile action which has a local cause is not an essential fever, and should not be described as such. It happens that in children a symptomatic remittent fever arises from a variety of local causes, as dentition, intestinal worms, subacute gastro-intestinal inflammation, etc. But all such cases should be excluded from our consideration of remittent fever, as clearly as we distinguish the continued fever of pneumonia or bronchitis from that of typhus or typhoid.

There is an essential remittent fever of children due to malaria. The same conditions which produce intermittent fever, do, in a certain proportion of cases, produce a fever which does not intermit, but continues with more or less pronounced exacerbations a certain number of days, when it ceases or becomes intermittent. Cases, too, are not infrequent in localities not malarious, of a remittent fever, occurring more frequently in the spring and autumn than in other seasons. Some of these cases are perhaps a mild type of typhus, but in most instances the conditions do not appear to be present which ordinarily give rise to typhus, and they do not occur in connection with cases of typhus in adults. The cause, though obscure, is apparently atmospheric.

The SYMPTOMS of remittent fever vary in different cases. The exacerbations and remissions are more pronounced in some than others. Even in those cases in which the fever is due to paludal emanations, and occurs in connection with cases of the intermittent, the febrile movement may be almost uniform, slight exacerbations occurring in the latter part of the day. In other cases the exacerbations and remissions are pronounced, the febrile excitement abating in a perspiration. Occasionally the fever is higher on each second day. Cephalalgia is common, and in severe cases delirium and stupor are not infrequent. There may be distinct remissions in the beginning, and afterwards, for a few days, the fever be pretty uniform, when it again remits or ceases. The tongue is covered with a light fur. Thirst, loss of appetite, a tendency to constipation, scanty and high-colored urine, containing perhaps urates, and a cough due to mild bronchitis, are common symptoms.

When remittent fever is due to marsh emanations, the same anatomical characters are doubtless present as in the adult, namely, blood containing more or less pigmentary matter, enlargement of the spleen, bronzing of the spleen, and, in severe cases, of the liver, and sometimes of the brain.

The DIAGNOSIS is not always easy. On the one hand, local diseases with symptomatic remittent fever are to be excluded, and, on the other, typhus and typhoid. The discrimination of it from typhus and typhoid fevers is practically of little moment, but it is a matter of vital importance to make a differential diagnosis between it and the local diseases. I have known one of the acutest diagnosticians and most eminent physicians of New York mistake incipient meningitis for it, a mistake indeed not uncommon. The points involved in a differential diagnosis will be considered in our descriptions of the local diseases.

TREATMENT.—If we have ascertained by a careful examination that the fever is remittent, and not symptomatic but essential, there is one remedy which is required in nearly all cases, namely, quinia, or its equivalent, cinchonia. Mild febrifuge medicines, with light diet, may be first employed in sthenic cases, in which the pulse is full and strong, and the quinia given when the fever has somewhat abated. The diet should be bland but nutritious, and the bowels be kept regularly open by citrate of magnesia or other mild aperient. Bromide of potassium or hydrate of chloral may be occasionally employed as recommended in the treatment of typhoid fever, to produce quietude or sleep, in cases attended by delirium or insomnia. A warm mustard foot-bath, and cool applications to the head, are useful in such cases.

CHAPTER III.

TYPHOID FEVER.

Typhus and typhoid fevers occur in children, but the former is mild and infrequent, rarely occurring except when adults of the same household are affected. It requires little treatment, except good nursing. Typhoid fever, on the other hand, is not infrequent in children, and, as it presents certain peculiarities prior to the age of puberty, it is proper to describe it in this connection. This disease is much less frequent in infancy than in childhood, and in the first half of infancy is believed to be rare. Still, there can be no doubt that many cases in the first years of life are not diagnosticated, being mistaken for subacute and protracted entero-colitis. It may, therefore, be more common in the infant than is commonly supposed. Its period of greatest frequency in children is between the ages of six and twelve years.

Causes.—It is now generally admitted that typhoid fever is mildly contagious, and that its specific principle abounds largely in the dejections and excretions of the patient. It is uncertain whether it is communicable by the breath of the patient, or exhalations from his surface. If it is, it is slightly so, while numerous observations demonstrate its communicability through the use of night-stools or privies which contain the evacuations. There is little doubt also that typhoid fever originates *de novo*, caused by the miasm produced by decaying animal or vegetable matter. Numerous cases have been observed in which it originated from defective sewerage, or decaying vegetables in cellars, in localities in which no case had previously been observed. The germs of the disease may not only be received into the system by inspiration, but also through the stomach, for the use of well-water which contains the drainage of sewers has repeatedly been known to cause it. Boys are more frequently attacked than girls, according to some statistics in the proportion of three to one. Deterioration of the health from general causes increases the liability to be attacked. On the other hand, those having tuberculosis, carcinoma, heart disease, and probably certain other visceral lesions, are more apt to escape than those in health.

Anatomical Characters.—As typhoid fever is a constitutional disease, we would expect to find early and important changes in the blood. No alteration, however, has been discovered in this fluid peculiar to typhoid fever. The amount of fibrin is diminished as in most of the essential fevers, and its coagulation is feeble, forming, when the blood stands, soft, small and dark clots. When the fever has continued for some time, a state of anæmia more or less decided supervenes, in which the amount of albumen and blood corpuscles is diminished. Although there are often decided symptoms referable to the nervous system, no constant changes have been discovered in the brain or spinal cord. The changes observed in them when death has occurred in the course of typhoid fever have been for the most part due to other causes. It is different with the respiratory system. After the first week of typhoid fever bronchitis is almost as constant as inflammation of the fauces in scarlet fever, and accordingly we find in fatal cases redness and thickening of the bronchial mucous membrane, which is covered with a viscid and ordinarily scanty secretion. Hypostatic congestion of the lungs, with more or less œdema, and in severe and enfeebled cases hypostatic pneumonia, are not uncommon. In the bronchitis and state of feebleness we have the causes of pulmonary collapse, and this lesion is not infrequent over limited portions of the lungs, especially if the bronchitis is unusually severe.

The lesions occurring in the digestive system are important. The mucous membrane of the small intestine is more or less injected, and at an early period, even by the second or third day, the patches of Peyer, solitary glands, and at the same time the mesenteric, begin to enlarge. It has been stated by high authorities that the enlargement is due to infiltration with a peculiar substance, which has been termed the typhous material. I have made microscopic examination of these glands in typhoid fever of the adult, and have found a notable increase of the small round granular cells of which these glands are composed. I do not, therefore, doubt that the enlargement is due mainly to hyperplasia of the cellular elements of the glands, though there is probably infiltration to a certain extent of inflammatory products between the cells. The mucous membrane over the glands undergoes inflammatory thickening and softening. In the adult, sloughing of this membrane is frequent, with the disintegration of the glands and their elimination into the intestines, producing ulcers, small and circular, corresponding with the site of the solitary glands, large and oval or irregular, corresponding with the site of the agminate. Disintegration of these glands and the formation of ulcers are less frequent in children than adults. In the adult, who recovers, the mesenteric glands, and those of the solitary and agminate which are not destroyed, return to their normal state by fatty degeneration, liquefaction and absorption of the redundant cells. In the child this is the common result, instead of sloughing and disintegration, as regards both the solitary and agminate glands, and uniform result as regards the mesenteric, and I may add bronchial glands, which are also in a state of hyperplasia. The absence of ulceration or its slight extent affords explanation of the fact that intestinal perforation is very rare in children.

The spleen gradually enlarges, often to twice the normal size, has a dark red color, and is softened. Enlargement of the spleen possesses great diagnostic value in those cases in which the diagnosis is obscure. For while very similar intestinal lesions may occur in chronic entero-colitis, the coexistence of these lesions with the splenic enlargement and softening shows the constitutional nature of the affection.

In cases which are severe, and presenting a decidedly adynamic type, the muscles become soft and flabby, and the action of the heart is feeble, more or less passive congestion of the viscera is the result. In such cases congestion of the kidneys and albuminuria are not infrequent.

SYMPTOMS.—Typhoid fever has a prodromic stage of a few days, sometimes of a week or more, in which the child appears languid, indisposed to play, and has little appetite, but complains of no pain unless occasional slight headache, and has no symptom which would lead the friends or even physicians to suspect the grave nature of the disease which impended. By and by a slight fever occurs.

The febrile movement, which gradually becomes more pronounced, remits, but does not cease in the morning, and has evening exacerbations. After the first week of fever the remissions are less marked, but the fever is not uniform at any period in its course. Hence some of our ablest writers on diseases of children continue to designate typhoid fever of children remittent fever, fully aware of its identity with typhoid fever of the adult. As the case advances, the appetite fails, all solid food being refused, and liquid food being taken more from thirst than hunger. The tongue in the first week is covered with a light moist fur, and in some patients throughout the course of the disease, but in others having a graver type of the fever the tongue after the first week is dry and brown. During the prodromic period, and in the first week, the bowels act regularly, or are slightly relaxed, and they are readily affected by purgative medicines. After the first week there is in most children a tendency to diarrhœa, which requires now and then the use of astringents, the stools being watery and brown, or dark yellow. The abdominal walls are seldom retracted, but prominent, especially after the first week, in consequence of meteorism which is present in children as well as adults. Sometimes there is apparent tenderness, when pressure is made over the right iliac region, but this must not be confounded with hyperæsthesia, which is common in the commencement of febrile diseases in children, and which is observed especially upon the abdomen, chest, and inner part of the thighs.

The respiration in the first week is slightly accelerated, as it is in all febrile diseases. In the second week, and subsequently when bronchitis is developed, the respiration is ordinarily more accelerated, though not in a marked degree, unless in those exceptional instances in which there is an abundant collection of mucus in the smaller bronchial tubes. A cough is always present, dependent on the bronchitis, and varying in character according to the degree and stage of the inflammation. In the first days of the fever it is infrequent, and hacking; at a later stage it is more frequent, and not so dry, though in cases of ordinary severity the amount of expectoration is inconsiderable. Hypostatic congestion, œdema, hypostatic pneumonia, splenization, or thickening of the alveolar walls, and collapse, which may and some of which not infrequently do occur in the advanced disease, increase more or less the frequency of the respiration and the cough, and modify the physical signs.

The pulse in the first week, in ordinary cases, is from 100 to 110 or 115. It gradually becomes more accelerated, numbering in the second week 120 or more; in grave cases even 160. The more frequent the pulse, the greater the danger and more unfavorable the prognosis. During the exacerbations the number of pulsations per minute is 15 or 20 more than in the remissions. The change in temperature corresponds with that of the pulse, being from 1° to 2° higher in the exacerbation than remission. The extremes of temperature in cases of ordinary severity are about 101° and 104°. A temperature above 105° shows a grave, probably a malignant, type of the disease, or else a serious complication.

There is great variation as regards the symptoms referable to the nervous system. Headache is common in the prodromic and initial stages, after which it ceases. A few are delirious even from an early period, screaming loudly, or muttering incoherently, but the majority are quiet, having, indeed, a degree of mental dulness, but being able to appreciate questions when aroused, and answering correctly. Subsultus tendinum and carphologia, which some exhibit, show that there is profound disturbance of the nervous system. Epistaxis occurs occasionally in the first week as in the adult, but is not abundant.

The rose-colored eruption appears in children as well as adults between the sixth and twelfth days, but is more frequently absent in the former than latter, sometimes the number of spots is less than half a dozen. Sudamina are common in the second and third weeks, and perspirations may occur at any time in the course of the fever, but without amelioration of symptoms. More or less deafness is common, being in most instances a purely nervous symptom, without, therefore, any structural change in the ear, but it is possible, as has been suggested by certain writers, that it sometimes results from inflammatory thickening of the Eustachian tube or external meatus, or to a weakened and flabby state of the muscles of the ear.

The duration of typhoid fever is not uniform; while mild cases may end in two weeks, those of a severer type continue three or even four, the patient becoming progressively more emaciated and feeble. In protracted and severe cases his condition seems very unpromising to one not familiar with the clinical history of the fever. Pale, emaciated, and feeble, probably passing his evacuations in bed, taking little notice of objects around him, he presents, at the close of the third week, an appearance of helplessness, notwithstanding the best of nursing, and the constant employment of sustaining measures, which is truly discouraging.

COMPLICATIONS.—The chief complications of typhoid fever are broncho-pneumonia, already sufficiently described, enteritis, intestinal hemorrhage, peritonitis, otitis, parotiditis, and muguet. In one instance I lost a patient about ten years old, in whom the fever had nearly terminated, by the sudden accession of croup. There is, as we have seen, in ordinary cases, a degree of inflammation of the mucous membrane of the air-passages, and of the intestines especially in the vicinity of the patches of Peyer. It is easy to understand how, under circumstances which may arise in the fever favorable to the development of mucous inflammations, the bronchitis and enteritis may so increase as to constitute complications. They are the most frequent of the serious complications.

Intestinal hemorrhage is an occasional complication. Hillier met four cases in thirty of the fever. It indicates the presence of ulcers upon the surface of the intestines. It is one of the most serious of the complications. Some, in whom it has occurred, recover, but others die. Otitis, commencing with pain, and producing a discharge which may continue for weeks, is not rare, though less frequent than in scarlet fever. The otitis is commonly external, but it may, in scrofulous subjects, extend to the middle ear.

Intestinal perforation is more rare in children than in adults, as might be inferred from the statement already made, that intestinal ulceration is less frequent and extensive in them. Statistics show that perforation occurs only once in 232 cases. Therefore, as perforation is the common cause of peritonitis in this disease, this inflammation is a rare complication. Peritonitis may, however, occur in typhoid fever without perforation. In one such case (an adult) in the fever wards attached to Charity Hospital, local peritonitis with fibrinous exudation occurred opposite two ulcerated patches of Peyer, the ulcers extending nearly to the peritoneum, but not perforating. The lesions observed in this case throw light on those cases of peritonitis complicating typhoid fever which recover, the cause of which has received a different explanation.

In advanced and greatly debilitated cases, thrush sometimes appears in the interior of the mouth, and upon the fauces. It is always an unfavorable prognostic symptom in children suffering from chronic or protracted disease. Parotiditis is also a rare complication.

Diagnosis.—This is more difficult in children than in adults, and the younger the child the greater the difficulty. In infants protracted entero-colitis, with febrile action and dry furred tongue, cannot in certain cases be positively diagnosticated from typhoid fever by the symptoms and clinical history. Typhoid fever is believed, however, to be rare at this age. When, however, as now and then happens, a young child presents the symptoms characteristic of protracted subacute entero-colitis, or typhoid fever, and older members of the household have the fever, it is highly probable that the case is one of the latter disease, and it should be treated accordingly.

Even in older children typhoid fever is apt to be mistaken for simple subacute enteritis, or entero-colitis, or *vice versâ*. The following facts aid in the differential diagnosis. In typhoid fever there is total loss of appetite, while in the subacute intestinal inflammation food is not entirely refused. Diarrhœa commences early in the inflammation, while in the fever it is not ordinarily till after the lapse of a few days. The tenderness of the fever is either not appreciable, or it is located in the right iliac region; in the other disease it is general over the abdomen, or located in the umbilical region. In typhoid fever there is bronchitis with a cough which is absent in the inflammation. In typhoid fever there are certain other symptoms, more or fewer of which are present in most cases, and which do not occur in the intestinal diseases, except as a coincidence. For example, headache, epistaxis, stupor, delirium, and perhaps the rose-colored spots.

Typhoid fever may be mistaken for meningitis, during the first week, but in meningitis there is more constipation, irritability of stomach, and less elevation of temperature; moreover, in meningitis, at a comparatively early stage, we are able to detect patches of congestion of the features coming and disappearing suddenly; slight inequality of the pupils, or their oscillation when the light is uniform; signs which are lacking in typhoid fever. In a doubtful case the ophthalmoscope might be employed, which in meningitis discloses congestion of the vessels of the retina, œdema, etc., anatomical changes which do not pertain to typhoid fever.

The differential diagnosis of typhoid fever and acute tuberculosis may be made by attention to the following points. In tuberculosis there is cough, with some acceleration of respiration from the first, without epistaxis, stupor, or other nervous symptoms, and without the abdominal symptoms which are so prominent in the fever.

Duration.—The duration of typhoid fever varies from two to about four weeks, and complications which may arise greatly retard convalescence. Recovery from a severe and protracted attack is slow, several weeks or even months elapsing before complete restoration to health. A tendency to diarrhœa may continue several weeks after the fever proper ceases, necessitating a rigid oversight of the diet, and the occasional employment of astringents.

Prognosis.—A much larger percentage of children recover than of adults. Although there is great emaciation with loss of strength, recovery may be confidently predicted, provided no serious complication occurs. In the fatal cases which I have met, the unfavorable result occurred as a rule from the complications, rather than directly from the fever. The condition in which severe typhoid fever leaves a patient is favorable to the development of tubercles, and now and then they occur, disappointing our expectations and prediction of recovery.

TREATMENT.—As typhoid fever is self-limited, the treatment required in ordinary cases is simple. It should be of a sustaining nature, both as regards diet and medicinal agents, and any untoward symptoms should be promptly met by appropriate measures. The food should be in the liquid form; solid food is, indeed, in most cases, refused. Beef-tea, milk, rice or barley-water, with milk, may be allowed from the first. Mild cases require no stimulants, still the moderate use of wine is not contraindicated in such cases, and may be allowed at an early period. In grave cases, characterized by a dry and furred tongue, and quick and compressible pulse, milk-punch or wine-whey should be employed in suitable quantity at regular intervals.

When the fever is mild and pursuing its normal course, a simple febrifuge may be employed, as spts. ætheris nitrosi, with syrup of ipecacuanha.

℞. Spts. æther. nit. ʒij;
Syr. ipecac. ʒiij;
Syr. simplic. ℥jss. Misce.
Dose, one teaspoonful every three hours to a child of six years.

If the fever has distinct evening exacerbations, quinine is indicated as an antiperiodic, and in cases of an asthenic type, it may be employed in smaller doses as a tonic. In either of these conditions it will be found useful. In cases attended with great restlessness or delirium, an appropriate dose of bromide of potassium or hydrate of chloral at night, will procure rest, and be followed by no unfavorable result. I prefer the hydrate of chloral given in a small dose. A single dose of two or three grains of this agent will generally be sufficient. For the diarrhœa, I ordinarily prescribe paregoric, with half its quantity of the fluid extract of catechu in chalk mixture. The state of anæmia which is present in the advanced disease and in convalescence requires the employment of iron. The citrate of iron and quinine will, under such circumstances, be found useful.

CHAPTER IV.

ACUTE RHEUMATISM.

Rheumatism is a constitutional disease with a local manifestation, namely, an inflammation of the sero-fibrous tissues chiefly in and around the articulations, but occasionally in other parts. It is less frequent prior to puberty than in the years succeeding it; still, it is not uncommon in children after the fifth year. Under this age it is comparatively rare, but is, probably, not so infrequent as is commonly supposed. For while in the adult the diagnosis of rheumatism is easy, in children this disease is likely to be overlooked, if, as is true in a large proportion of cases in early life, the swelling and redness of the affected joints are slight, and only a few joints are inflamed. If there is cardiac inflammation, the articular affection may be nearly absent, thus rendering the diagnosis more obscure. That rheumatism is not so very rare under the age of five years, I infer from the fact that we now and then meet with cases of valvular disease in children of this age or older, which, there can be little doubt, had its origin in rheumatism, although the parents are not aware that there has ever been an attack of this disease. Several such cases have recently been brought to the children's class in the Out-door Department at Bellevue. Thus, in January, 1871, a little girl, three years old, was presented, having distinct aortic direct, and mitral regurgitant murmurs. The mother was not aware that she had had rheumatism, but at the age of twenty months she had for several days pretty active febrile symptoms, which the physician attributed to disease of the lungs. In April, 1871, another girl, of the same age, was brought to the clinique, having a distinct mitral regurgitant murmur. The mother stated that she had been well till a month previously, when she was confined to her bed for a few days, having a high fever. She was attended by a homœopathic physician, and the exact character of her sickness the mother was not able to state. Further medical advice was sought, as the child remained delicate, though her health was better than at first. There can be little doubt that the obscure fever in this case had been rheumatic. In another child treated elsewhere, not old enough to relate the subjective symptoms, there was, in addition to an intense fever, evident pain in one foot or leg, when the limb was moved. Still, the nature of the disease was not diagnosticated till some time after recovery, when a valvular murmur was accidentally discovered. Such histories, which I do not think are rare, show, if my opinion of them is correct, that rheumatism may occur not very rarely in young children, even infants, for which purpose they are here introduced, but they inculcate the important practical lesson, that the disease at this age may be so obscure, or latent, as to be overlooked even by good diagnosticians.

Some observers, meeting cases of valvular disease in children, without the history of rheumatism, have concluded that rheumatism is not the chief cause of endocarditis at this age (Dr. A. Steffen, *Jahrbuch für Kinderk.*, 1870); but the explanation which I have given seems to me more in consonance with the facts. Scarlet fever not infrequently causes endocarditis, but this exanthem is not apt to occur without detection, and it has been as often absent as has rheumatism from the histories as given by the parents of young children with valvular disease, whom I have examined. Moreover, it is a question whether the endocarditis of scarlet fever is not, properly speaking, of a rheumatic origin.

Rheumatism in children is primary or secondary. The secondary form occurs chiefly in the declining stage of scarlet fever and variola. It is stated, also, to occur occasionally in new-born infants during epidemics of puerperal fever. I have not observed such cases.

CAUSES.—The important cause of rheumatism is a predisposition, which, in a large proportion of cases, is inherited. Hence the fact that it is apt to occur in different members of the same family. When the family history shows a strong predisposition to rheumatism, it occurs in the child from a slight exciting cause; if no such predisposition exists, it only occurs through unusual circumstances of exposure. The ordinary exciting cause is the same as in most idiopathic inflammations, namely, exposure to cold; but a strong rheumatic diathesis appears to be sufficient in itself to produce an outbreak of the disease. Children who have had one attack are especially liable to another.

SYMPTOMS.—The commencement of acute idiopathic rheumatism is in most cases sudden; occasionally fever, and a degree of soreness or stiffness, precede the articular affection for a few hours or days. The inflammation, slight at first, increases gradually, attaining its maximum intensity within one or two days. The joint is painful, red, hot, and swollen. The swelling is due to inflammatory œdema of the tissues surrounding the joint and effusion within the joint. As in all inflammations, the vascularity of the parts involved is increased, the synovial membrane loses more or less its lustre, and the effused fluid, which is mainly serum, has been found, in most of the cases in which an opportunity was presented to examine it, to contain, like the pleuritic exudation, a few globules of pus. Rarely, in a reduced state of the system, so much pus is produced within the joint as to constitute a true abscess, and rarely also fibrin is exuded, producing a rubbing sensation when the joint is moved, and endangering permanent adhesion of the articular surfaces. Fortunately, however, in the vast majority of cases, the substance exuded both without and within the joint is mainly serum, and therefore the rapid subsidence of the swelling when the inflammation ceases. The pain is commonly not severe when the child is quiet, but it is greatly increased if the joint is pressed or the limb moved.

The joints of the extremities are most frequently the seat of rheumatic inflammation, but occasionally those of the trunk, as the intervertebral, the symphysis pubis, etc., are involved. As the inflammation abates in the articulations first affected it reappears in others, unless the materies morbi has been eliminated from the system. It is seldom that more than two or three of the joints are in a state of active inflammation at the same time.

The temperature in acute rheumatism is elevated two or three degrees above that of health, and the pulse varies from 120 to 140, its frequency depending on the age of the patient, as well as the gravity of the disease. Perspiration is a common symptom. The appetite is impaired, the tongue slightly coated, and the bowels constipated. The watery element in the urine is diminished, as in most febrile diseases. There is no corresponding reduction in the solid elements, so that the urine is rendered more dense, and its specific gravity is high. The amount of urea and coloring matter excreted from the kidneys is augmented during the active period of rheumatism, and the urine, when it cools, deposits urates. In ordinary cases there is no prominent symptom referable to the nervous system, with the exception of the pain in the affected joint.

Acute rheumatism, if only the articulations were involved, would be a disease of little danger, however painful, but unfortunately, in its proneness to produce specific inflammation of the sero-fibrous tissues, the heart frequently becomes involved, less frequently the lungs and pleura, and in rare instances the cerebral or spinal meninges. Endocarditis is the most frequent of the heart inflammations occurring in rheumatism; pericarditis, though less common, is not infrequent, while in rare instances myocarditis occurs, usually associated with the other inflammations. Endocarditis is limited to the left side of the heart, and seldom continues long without engaging the valves, aortic or mitral, or both, causing their infiltration, fibroid degeneration, with consequent thickening, and sometimes adhesion. The valvular lesion thus produced is in most instances permanent, so impairing the action of the valves as to obstruct in greater or less degree the flow of blood through the orifice or allow its regurgitation.

The mitral valve is more frequently affected than the aortic, at least *bruits* produced by this lesion are more frequent in the mitral than aortic orifice, and when they are heard in both orifices they are commonly loudest in the mitral. This fact, noticed by different observers, I have repeatedly verified by observations in this city.

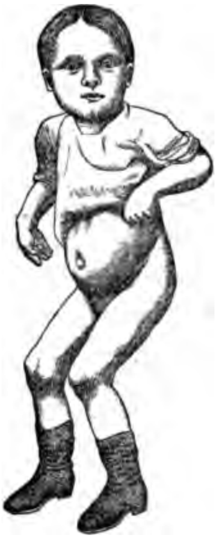
While the articular affection pertains to the clinical history of rheumatism, the internal inflammation, whether of the heart, lungs, pleura, or meninges, though similar as regards its pathological character, is properly regarded as a complication. Acute rheumatism is so frequently complicated by one or the other of these affections, that any disproportionate severity in the general symptoms, as compared with the inflammation of the joints, or any sudden and unexpected increase in the symptoms, should always lead the physician to examine thoroughly the condition of those organs which are most frequently affected.

Inflammatory complications occur, as a rule, during the active period of rheumatism, when the inflammation is passing from joint to joint. If the general symptoms begin to improve, and no new joints are involved, the liability to complications is greatly diminished. Secondary rheumatism, occurring in most instances in connection with certain eruptive fevers, especially scarlatina, commonly affects only a few joints, often only one or two, as the wrist, and, though painful, is attended by slight swelling and redness.

DURATION, PROGNOSIS.—With proper treatment and without complication the febrile action in a few days begins to abate, and the disease commonly terminates within two weeks. Its duration is ordinarily shorter than in rheumatism of the adult. Fluctuations, however, are liable to occur. The disease may appear to be abating, and the articular inflammations nearly cease, when they return for a time, often without new exposure and without appreciable cause. The prognosis, even when cardiac inflammation has supervened, is in most cases favorable, except so far as the lesion resulting from this inflammation is concerned, which being permanent may entail much subsequent suffering, and occasion death after months or years. Indeed, what is most to be dreaded in cases of acute rheumatism is valvular disease or pericardial adhesion with its remoter consequences, namely, hypertrophy of heart, congestion and œdema of the lungs, dropsies, etc.

Secondary rheumatism occurring in scarlet fever is sometimes also complicated with, or rather coexists with, cardiac inflammation, pleuritis, or pneumonitis, rendering the prognosis more unfavorable.

In rare instances the acute symptoms of rheumatism abate, but the joints remain stiff and more or less swollen, and painful when moved. The acute has lapsed into a subacute or chronic rheumatism. Such a case, represented in the accompanying figure, was brought to the children's class in the Out-door Department at Bellevue Hospital, in February 1871. E. H., female, 3½ years old, had intermittent fever from the age of nine to fifteen months. From this time she remained well till the age of two years, when she was taken with acute rheumatism, commencing in her ankles and extending to other joints. The knee and hip joints on both sides have only partially recovered their mobility, and both legs and both thighs are permanently flexed, so that the gait is slow and unsteady. It is impossible to straighten either limb without causing great pain, and attempts to straighten the thigh produce the arch in the back very similar to that in coxalgia.



Diagnosis.—This is not difficult in ordinary cases, if a proper examination is made. In the commencement, if the affection of the joints is slight, rheumatism might be mistaken for remittent, typhoid, one of the eruptive fevers, or meningitis; but, on careful examination, tenderness will be observed of one or more of the articulations, and probably some swelling. This tenderness is readily distinguished from the hyperæsthesia which is common in the first stage of the essential fevers, and which is observed when pressure is made upon the chest or abdomen as well as upon the limbs, and is more marked between the joints than in them. Any doubt which may at first exist, whether the patient may not have one of those diseases, is soon dispelled, since their clinical history presents notable differences from that of rheumatism.

I have known scrofulous arthritis, or scrofulous ostitis near the joint, present so close a resemblance to acute rheumatism as to be at first mistaken for it. In one instance this inflammation commenced in three distinct points, so that the differential diagnosis at first was difficult. But scrofulous inflammation as well as that from pyæmia can be diagnosticated from rheumatic disease of the joints, by its greater persistence, less induration and symmetry in the swelling, and by the history of the case. Chronic rheumatism may produce deformity similar to that from chronic scrofulous inflammation, as in the case detailed above, but the rheumatic history, number of joints affected, bilateral character of the inflammation, good general health, etc., are sufficient to establish a clear diagnosis.

TREATMENT.—The theory of the pathology of a disease determines the mode of treatment. It is believed that rheumatism is due to an acid, probably lactic, in the blood, and hence alkaline remedies are commonly employed, with the apparent effect of diminishing the severity of the disease and shortening its duration. The tartrate of soda and potassa, acetate of potassa, and the bicarbonate of soda or potassa, may be given singly or combined, according to the condition of the patient. The following is a good formula for a previously healthy child of six or eight years:—

℞. Potas. et sodæ tart. ℥ss;
Potas. acetat. ʒij;
Syr. limonum,
Aquæ, āā ℥iij. Misce.
Dose, two teaspoonfuls every two or three hours.

Sulphate of morphia, Dover's powder, or other opiate, is ordinarily required in the evening to procure rest and prevent any undue purgative effect of the medicine. If there is considerable pain in the joints, one or two doses of the same should be given through the day. If there is a tendency to diarrhœa, or a state of debility, measures of a more sustaining nature are required. For such cases the bicarbonate of soda or potassa is preferable to the other alkalies.

In a few days, by the alkaline treatment, the urates cease to appear in the urine, and the disease begins to decline. There is now little danger that any complication will occur if the internal organs have so far escaped. I know no remedies so effectual in relieving not only rheumatic inflammations of the joints, but the general muscular tenderness which occurs from taking cold, and which is often present in the commencement of rheumatism, as the Rochelle salts and acetate of potash.

During the declining period of rheumatism and in convalescence, quinine or some preparation of cinchona should be employed, and the alkali given less frequently. This tonic does indeed appear to exert a beneficial effect on the course of rheumatism, and it is employed by some judicious and experienced physicians from the commencement, as the main remedy. Certainly, in all cases of debility, it, or a similar medicine, should be early employed, unless contraindicated by some complication.

Rheumatism impoverishes the blood, and the patient often begins to present an anæmic appearance, when he requires iron in addition to the vegetable tonic. The citrate of iron and quinine may then be employed.

Secondary rheumatism requires sustaining treatment from the first. Cases occurring in my practice have done well without alkalies, and with the general supporting measures employed for the primary disease.

Pneumonitis complicating rheumatism is best treated by moderate counter-irritation and emollient poultices, and the internal use of carbonate of ammonia; or, if there is anæmia, carbonate of ammonia with citrate of iron and ammonia. The other internal inflammations which are liable to arise as complications require iodide of potassium in decided doses. In pericarditis or endocarditis, if, as is commonly the case, the movements of the heart are accelerated, the tincture of aconite root, or, in young and debilitated children, tincture of digitalis, is required to the extent of reducing the number of pulsations to near the normal frequency. A child of six years can take one drop of aconite, or three or four times the quantity of digitalis, to be repeated, if necessary, in three hours, till the required reduction of the pulse is effected. Patients often express the relief from the palpitation and dyspnœa which they experience by the use of these agents.

The patient should be kept quiet, in a room of uniform temperature, and not exposed to draughts of air. By such precaution the danger of complications is greatly diminished. Repellent applications, as cold or irritants, should not be applied to the joints, as long as the disease is acute, for they also increase the danger of complications. The affected joints should be enveloped in flannel or cotton, and the pain, if intense, may be diminished by applying flannel wrung out of warm water. If the disease becomes subacute or chronic, if the urates have disappeared from the urine, and the inflammation ceases to pass from joint to joint, the tincture of iodine, or moderately stimulating embrocations, applied to the joints, involve no danger and are useful.

CHAPTER V.

ERYSIPELAS.

THE term erysipelas is applied to a constitutional or blood disease, which is characterized by inflammation of the skin and subcutaneous cellular tissue, and by a tendency to spread. It is accompanied by a burning and pricking sensation, swelling, and subcutaneous infiltration.

In rare instances, in young infants, an inflammation which has been designated erysipelas occurs in and around the umbilicus. It commences about the time of the detachment of the umbilical cord, and is accompanied by redness of the skin, tumefaction, and hardness of the cellular tissue surrounding the umbilicus. It usually causes ulceration of the umbilical fossa, and, in fatal cases, pus is sometimes found in the umbilical vessels. This disease does not show any tendency to spread; the diameter of the inflamed surface is not more than three or four inches, with the umbilicus at the centre. It is generally fatal; but two favorable cases have been reported to me, in one of which there was considerable ulceration, and after recovery a firm cicatrix occupied the site of the umbilicus. The most reasonable view is that this disease is primarily an inflammation of the umbilical fossa and vessels, induced by uncleanliness, cachexia, or other cause. It lacks the distinguishing feature of erysipelatous inflammations, namely, the tendency to spread, and I shall therefore take no further notice of it in this connection. (See Diseases of the Umbilicus.)

Erysipelas seldom occurs in childhood; the few cases which are met in this period present nearly the same features, and pursue nearly the same course, as in the adult. In infancy, on the other hand, erysipelas is not a rare disease. Every practitioner is called to cases, from time to time. The following remarks relate to erysipelas occurring in this period of life. My views have been derived mainly from the records of cases which occurred in this city, some in my own practice, but most in the practice of other physicians. The points of chief interest in forty-one cases are embraced in the following table:—

Cases of Infantile Erysipelas.

No.	Sex.	Age.	Point of commencement.	Parts affected.	Duration.	Result.
1	M.	5 months	Right knee	Entire surface, except face and scalp	5 weeks and 3 days	Recovered.
2	M.	2 years	Left knee	From a little above the knee to the ankle	7 days	Recovered.
3	M.	10 months	Elbow	Whole arm and forearm	....	Recovered.
4	F.	1 year & 8 months	Below right knee	Entire leg, thigh, and trunk to the umbilicus	7 days	Recovered.
5	F.	9 months	Vulva	Abdomen, chest, and all the extremities	18 days	Recovered.
6	M.	9 days	Genitals	Both lower extremities, abdomen to the umbilicus	6 days	Died.
7	F.	1 year	Vulva	Entire surface, except face	6 weeks	Recovered.
8	F.	6 weeks	At or near the ear	Forehead and side of face	1 week	Died in tetanic spasms.
9	..	9 months	Epigastric region	Trunk and lower extremities	2 weeks	Died in tetanic spasms.
10	F.	10 months	At angle of mouth	Entire face and scalp	10 days	Recovered.
11	F.	4 weeks	Vulva	Entire surface, except face	3 weeks	Died.
12	F.	3 months	Vulva	Surface of abdomen to umbilicus and right lower extremity	2 weeks	Recovered.
13	F.	4 to 5 mos.	Vulva	All the limbs and the trunk, except the chest	3 to 4 weeks	Died.
14	F.	5 months	From syphilitic sores around anus	Trunk and both lower extremities	....	....
15	F.	3 months	Vulva	Entire trunk and both upper extremities	3 weeks	Recovered.
16	M.	8 months	Face near nostrils	Entire trunk and both upper extremities	About 2 weeks	Recovered.
17	F.	4 months	Vulva	Entire trunk and all the extremities	1 week	Died.
18	F.	7 months	Knee	A portion of trunk and both lower extremities	3 weeks	Recovered.
19	F.	6 months	Near the ear	Entire face and forehead	10 days	Recovered.
20	M.	7 days	Left eyelid	Left side of face	8 days	Died.
21	M.	14 days	Genitals	Extended to knees, over abdomen to the chest	4 days	Died.
22	M.	3 months	Under the chin	Chin, left cheek, neck, left side of trunk, left thigh, and leg	....	....
23	F.	2 years & 4 months	Right shoulder	Arm and forearm	1 day	Died in convulsions.
24	F.	3 or 4 days	Vulva	Body and all the limbs	12 days	Died.
25	F.	3½ months	Under left ear	Neck, chest, and arms	About 2 weeks	Died.
26	..	7 months	Below right knee	Trunk, neck, and head, and all the limbs	2 weeks	Died comatose.
27	F.	6 months	Vulva	Both thighs, and nearly entire trunk	3 days	Died comatose.
28	M.	10 months	Near point of vaccination	Shoulder, arm, and forearm	21 days	Recovered.
29	M.	4 months	Near point of vaccination	Chest, and both upper limbs	2 weeks	Recovered.
30	F.	2 months	Near vaccine vesicle	Trunk, and all the limbs	10 days	Died.
31	..	3 to 4 mos.	Near vaccine vesicle	Arm, forearm, and shoulder on one side	2 to 3 weeks	Died.
32	F.	4 months	Near vaccine vesicle	Arm, forearm, and trunk	2 months	Died.
33	M.	2 months	Near vaccine vesicle	Nearly entire surface	1 week	Died with peritonitis.
34	M.	5½ months	Near point of vaccination	Arm and forearm	....	Recovered.
35	M.	2¼ months	Near point of vaccination	Arm	7 days	Died probably of peritonitis.
36	M.	8 months	Near vaccine vesicle	Arm and forearm	17 days	Died.
37	..	5 months	Left foot	Leg, thigh, and lower part of trunk	2 weeks	Died with pneumonitis.
38	..	5 weeks	At one ear	Entire surface	2 weeks	Recovered.
39	..	2 months	Left leg	Trunk, and all the limbs	2 weeks	Recovered.
40	..	4 months	Near point of vaccination	Trunk, and all the limbs	2 weeks	Died.
41	M.	14 months	Face	Trunk, and all the limbs	4 weeks	Recovered.

flannel wrung out of warm water. If the disease becomes subacute or chronic, if the urates have disappeared from the urine, and the inflammation ceases to pass from joint to joint, the tincture of iodine, or moderately stimulating embrocations, applied to the joints, involve no danger and are useful.

CHAPTER V.

ERYSIPELAS.

THE term erysipelas is applied to a constitutional or blood disease, which is characterized by inflammation of the skin and subcutaneous cellular tissue, and by a tendency to spread. It is accompanied by a burning and pricking sensation, swelling, and subcutaneous infiltration.

In rare instances, in young infants, an inflammation which has been designated erysipelas occurs in and around the umbilicus. It commences about the time of the detachment of the umbilical cord, and is accompanied by redness of the skin, tumefaction, and hardness of the cellular tissue surrounding the umbilicus. It usually causes ulceration of the umbilical fossa, and, in fatal cases, pus is sometimes found in the umbilical vessels. This disease does not show any tendency to spread; the diameter of the inflamed surface is not more than three or four inches, with the umbilicus at the centre. It is generally fatal; but two favorable cases have been reported to me, in one of which there was considerable ulceration, and after recovery a firm cicatrix occupied the site of the umbilicus. The most reasonable view is that this disease is primarily an inflammation of the umbilical fossa and vessels, induced by uncleanliness, cachexia, or other cause. It lacks the distinguishing feature of erysipelatous inflammations, namely, the tendency to spread, and I shall therefore take no further notice of it in this connection. (See Diseases of the Umbilicus.)

Erysipelas seldom occurs in childhood; the few cases which are met in this period present nearly the same features, and pursue nearly the same course, as in the adult. In infancy, on the other hand, erysipelas is not a rare disease. Every practitioner is called to cases, from time to time. The following remarks relate to erysipelas occurring in this period of life. My views have been derived mainly from the records of cases which occurred in this city, some in my own practice, but most in the practice of ot physicians. The points of chief interest in forty-one cases are embraced in the following table:—

Cases of Infantile Erysipelas.

No.	Sex.	Age.	Point of commencement.	Parts affected.	Duration.	Result.
1	M.	5 months	Right knee	Entire surface, except face and scalp	5 weeks and 3 days	Recovered.
2	M.	2 years	Left knee	From a little above the knee to the ankle	7 days	Recovered.
3	M.	10 months	Elbow	Whole arm and forearm	....	Recovered.
4	F.	1 year & 8 months	Below right knee	Entire leg, thigh, and trunk to the umbilicus	7 days	Recovered.
5	F.	9 months	Vulva	Abdomen, chest, and all the extremities	18 days	Recovered.
6	M.	9 days	Genitals	Both lower extremities, abdomen to the umbilicus	6 days	Died.
7	F.	1 year	Vulva	Entire surface, except face	6 weeks	Recovered.
8	F.	6 weeks	At or near the ear	Forehead and side of face	1 week	Died in tetanic spasms.
9	..	9 months	Epigastric region	Trunk and lower extremities	2 weeks	Died in tetanic spasms.
10	F.	10 months	At angle of mouth	Entire face and scalp	10 days	Recovered.
11	F.	4 weeks	Vulva	Entire surface, except face	3 weeks	Died.
12	F.	3 months	Vulva	Surface of abdomen to umbilicus and right lower extremity	2 weeks	Recovered.
13	F.	4 to 5 mos.	Vulva	All the limbs and the trunk, except the chest	3 to 4 weeks	Died.
14	F.	5 months	From syphilitic sores around anus	Trunk and both lower extremities	....	....
15	F.	3 months	Vulva	Entire trunk and both upper extremities	3 weeks	Recovered.
16	M.	8 months	Face near nostrils	Entire trunk and both upper extremities	About 2 weeks	Recovered.
17	F.	4 months	Vulva	Entire trunk and all the extremities	1 week	Died.
18	F.	7 months	Knee	A portion of trunk and both lower extremities	3 weeks	Recovered.
19	F.	6 months	Near the ear	Entire face and forehead	10 days	Recovered.
20	M.	7 days	Left eyelid	Left side of face	3 days	Died.
21	M.	14 days	Genitals	Extended to knees, over abdomen to the chest	4 days	Died.
22	M.	3 months	Under the chin	Chin, left cheek, neck, left side of trunk, left thigh, and leg	....	....
23	F.	2 years & 4 months	Right shoulder	Arm and forearm	1 day	Died in convulsions.
24	F.	3 or 4 days	Vulva	Body and all the limbs	12 days	Died.
25	F.	3½ months	Under left ear	Neck, chest, and arms	About 2 weeks	Died.
26	..	7 months	Below right knee	Trunk, neck, and head, and all the limbs	2 weeks	Died comatose.
27	F.	6 months	Vulva	Both thighs, and nearly entire trunk	3 days	Died comatose.
28	M.	19 months	Near point of vaccination	Shoulder, arm, and forearm	21 days	Recovered.
29	M.	4 months	Near point of vaccination	Chest, and both upper limbs	2 weeks	Recovered.
30	F.	2 months	Near vaccine vesicle	Trunk, and all the limbs	10 days	Died.
31	..	3 to 4 mos.	Near vaccine vesicle	Arm, forearm, and shoulder on one side	2 to 3 weeks	Died.
32	F.	4 months	Near vaccine vesicle	Arm, forearm, and trunk	2 months	Died.
33	M.	2 months	Near vaccine vesicle	Nearly entire surface	1 week	Died with peritonitis.
34	M.	5½ months	Near point of vaccination	Arm and forearm	....	Recovered.
35	M.	2½ months	Near point of vaccination	Arm	7 days	Died probably of peritonitis.
36	M.	8 months	Near vaccine vesicle	Arm and forearm	17 days	Died.
37	..	5 months	Left foot	Leg, thigh, and lower part of trunk	2 weeks	Died with pneumonitis.
38	..	5 weeks	At one ear	Entire surface	2 weeks	Recovered.
39	..	2 months	Left leg	Trunk, and all the limbs	2 weeks	Recovered.
40	..	4 months	Near point of vaccination	Trunk, and all the limbs	2 weeks	Died.
41	M.	14 months	Face	Trunk, and all the limbs	4 weeks	Recovered.

Age.—Of the above cases, 27 were under the age of six months; 9 from six months to twelve, and only 5 above the latter age. A large majority, therefore, of cases of infantile erysipelas occur in the first year of life.

Point of Commencement.—In 58 cases in which I have ascertained the point of commencement, it was in 13 cases the vulva, 17 the arm after vaccination, 7 the leg, 6 the face, 3 the male genital organs, 3 at or near the ear, 1 the elbow, 1 the shoulder, 1 the nates, 1 the foot. In the adult, idiopathic erysipelas commonly commences upon the face, and affects only the face, ears, forehead and scalp. On the other hand, in infantile erysipelas, statistics show that the rash commences upon the face only in a small proportion of cases, one in nine, and that it rarely extends to the face when it commences in other parts.

Causes.—In erysipelas the first departure from the healthy state occurs in the blood, or the system generally. This undergoes certain changes which predispose to erysipelas, or are sufficient in themselves to give rise to it. Among the causes which produce this state of system, uncleanliness, residence in damp, dark, and crowded apartments, and defective alimentation, hold a principal place. Hence this disease is more common in the poor quarters of the city than in the country, and in dispensary and hospital than in civil practice.

In a large proportion of cases there is a local exciting cause of the erysipelatous eruption, namely, an irritation or inflammation at some point, generally trivial, but which is sufficient to develop the disease in the system already prepared for it. It is very apt to commence at or near a simple ecthymatous or impetiginous eruption, around burns or suppurating sores or syphilitic eruptions; it frequently commences, as is seen by the above table, near the point of vaccination immediately after vaccination, or when the pock is developed, or again when it has run its course and been detached. In a considerable proportion of cases it commences at a point where the skin is thin and delicate, or where it unites with a mucous surface, probably from some uncleanliness or irritation of those parts. Thus, I have records of cases in which it commenced at the external ear, commissure of the mouth, and at the vulva. Indeed, the frequency with which it commences at the vulva renders female infants more liable to it than males. In some instances erysipelas begins without any local exciting causes, upon smooth and sound skin, even when there are sores upon various parts of the surface.

Vaccination, as an exciting cause of erysipelas, demands particular notice. Often, doubtless, it is the inflammation, which necessarily arises from the cut or the vesicle, which operates as an exciting cause of the erysipelatous affection, and not any deleterious property contained in the virus which is employed, so that an equal degree of inflammation occurring in any other way, as from a burn, would be attended by a like result. But facts show that the virus itself occasionally contains a latent noxious principle, which, introduced into the system, operates as a cause of erysipelas. Thus, a little girl was vaccinated by me in November, 1860, and about the time when the vesicle began to fill she was seized with severe inflammation of the fauces, attended by tumefaction and infiltration of the submucous connective tissue. The inflammation rapidly subsided, and within a week from its commencement the throat affection had nearly or quite disappeared. I now believe that the disease of the fauces was erysipelatous, although it was not suspected at the time to have this character.

As the girl was otherwise healthy, and the vaccine vesicle passed through its usual stages, and presented the usual appearance, the scab was employed six weeks afterwards to vaccinate two infants. Within twenty-four hours after vaccination both these infants were seized with high fever, ushering in severe erysipelas, commencing in one around the point of vaccination, and in the other around syphilitic sores near the anus. In the former case the erysipelatous rash extended from the shoulder over the entire limb, and was obstinate, twice reappearing, and extending over the same surface; in the latter (a mulatto child) it extended over both lower extremities and a considerable part of the trunk, when the case passed into the hands of another physician, and the result is not known. The instrument with which the vaccinations were performed was clean. The vaccine disease did not appear in either of these cases.

Again, a well-known physician of this city vaccinated three infants, one his own (No. 32 of the table), with part of a scab which had been pronounced good, but was taken from a child that he had not seen, and with whose state he was not familiar. These infants were all affected with erysipelas from the vaccination, his own dying. He had taken the precaution to rub the lancet on his boot before using it. Another physician of this city has informed me that he vaccinated two children in the same family with a scab, with all the precautions that he had ever used, and both were soon after affected with erysipelas of a severe form, extending from the point of vaccination; the vaccine disease did not appear.

I know of no case in which the vaccine lymph gave rise to erysipelas, and, probably, it rarely or never does. In the lymph there is no admixture of foreign substances, whereas in the scab there is a large proportion of animal matter.

There is a form of erysipelas which occurs in the infant immediately after birth, and which is sometimes met in private practice, but is most frequently observed as an epidemic in lying-in wards. It is associated with severe, and commonly fatal, puerperal fever (metro-peritonitis), or erysipelas of the mother. This form of erysipelas is fatal, almost without exception, and its contagiousness is generally admitted by those who have had an opportunity to observe cases.

A case showing this relation of erysipelas in the newly-born infant to disease of the mother occurred in the practice of Dr. Leaming, of this city. A woman gave birth to a healthy infant, on the 27th of July, 1860. A few days subsequently she was seized with a chill, followed by erysipelas, commencing on the thighs, and terminating fatally August 17th. As no autopsy was allowed, the state of the internal organs was not ascertained. A few days before her death the same disease commenced on the infant. It extended around the neck, upon the ears, down the arms, and terminated fatally August 24th. But erysipelas in the new-born infant occurring in connection with erysipelas in the mother, is more rare than its occurrence with puerperal fever. The records of lying-in asylums furnish many examples of epidemics of puerperal fever, in which the infants of affected mothers perish of erysipelas.

The late Dr. Folsom, of this city, furnished me the following sketch of cases which occurred in his practice and that of his partner: "About the year 1840, being then in practice in New Bedford, Mass., I was called to visit a man who complained of pain in the knee. The next morning he was easier, but the following evening his symptoms grew worse, and as I was engaged in a case of obstetrics, my partner, Dr. E. C., now dead, visited him. At my call, next morning, I unexpectedly found the patient dying. The disease was obscure, and at the autopsy next day no lesion was discovered. In making the examination, Dr. C. pricked his finger, and experiencing little inconvenience from it at first, he attended a case of confinement on the following morning. A few hours subsequently he was taken sick, and I took charge of the lady, who died in three days, having the tumid abdomen and symptoms of childbed fever. The infant of the patient was seized, when two days old, with erysipelas, appearing on the face and in spots on the trunk and limbs, and terminating fatally in one day. Dr. C.'s finger became swollen and painful, and the lymphatics of the forearm and arm became inflamed, presenting red lines, and the axillary glands suppurated. Though feverish and much prostrated, there was no appearance of erysipelas in his case. In about two weeks he resumed practice, and as at that time physicians in this country were not fully aware of the danger of communicating puerperal fever, he attended two, three, or four obstetrical cases each week, until the number reached fifteen. All the mothers died with symptoms of metro-peritonitis, and all the infants had erysipelas, commencing on the face or some part of the body, generally on the second or third day after birth, and in all terminating fatally within a week. This sad record was finally ended by the doctor's temporarily retiring from practice."

Dr. Condie, in his Treatise on Diseases of Children, says: "Erysipelas of infants very commonly occurs during the prevalence of epidemic puerperal fever. Children of mothers who become affected with the fever are often born with erysipelatous inflammation; others are attacked almost immediately after birth. Whether, in these cases, the disease is to be referred to a morbid matter applied to the skin in the womb, or to the same epidemic or endemic influence which gives rise to the disease of the parent, it is difficult to say. According to M. Trousseau, infantile erysipelas is principally observed when puerperal fever prevails in the wards of the lying-in hospitals at Paris." In private practice it is rare that we meet erysipelas of the infant associated with erysipelas or with puerperal fever in the mother. Some of the oldest physicians of this city, with whom I have conversed, and who are engaged in extensive general practice, state that they have never met a case in which there was this relation. Cases like those observed by Drs. Folsom and Leaming only occur when epidemic erysipelas or puerperal fever is prevailing.

Premonitory Symptoms.—Infantile erysipelas in certain cases has no premonitory stage, or, if present, it escapes notice. In other instances there are well-marked precursory symptoms, as drowsiness, or restlessness, febrile movement, oppressed respiration, with perhaps vomiting, and starting or twitching of the limbs. In Cases 28 and 37 of the table, which occurred in my practice, the febrile movement, restlessness, and oppressed respiration were so great for three days before the appearance of the eruption, as to cause much anxiety. In the adult, pharyngitis often precedes the occurrence of the rash upon the skin. The same inflammation may be present in the premonitory period of infantile erysipelas, as well as during the period of erysipelatous eruption. The hurried and difficult respiration, which is present in the commencement of some cases, is probably due to an erysipelatous turgescence of the bronchial mucous membrane.

Symptoms.—The patient with this disease is usually restless, in consequence of the burning pain which accompanies the eruption. In severe cases there is little sleep, night or day, except from medicine. The sleep is short, and is often interrupted by sudden starting, or twitching of the limbs. Convulsions may occur, but are not common.

Febrile movement is constant, and is proportionate to the extent and gravity of the erysipelas. I have notes of cases in which the pulse was more than 200 per minute, although other symptoms did not indicate immediate danger. The skin not affected by erysipelas is dry and hot, though not possessing the pungent heat of the inflamed portion; face often flushed; tongue moist, and covered with a light fur; stomach usually retentive. The state of the bowels varies; sometimes they are regular, sometimes variable, while in other cases the stools are green, and more frequent than natural. I have records relating to the state of the bowels in twenty cases, as follows: in seven, regular; in nine, loose; in two, constipated; in one, constipated, then loose; and in one, constipated, then regular. Diarrhœa, when present, is usually mild, requiring little or no treatment. The erysipelatous redness is not in all cases so pronounced as in the adult, but otherwise there is nothing peculiar in its appearance. In feeble infants, with an impoverished state of the blood, its color is pink, instead of the deep red which characterizes the inflammation in the robust. Points of vesication may occur where the inflammation is most severe, as in the adult, and subsequently the same desquamation and œdema.

If the infant is debilitated, there is great danger of the formation of abscesses, around which the inflammation lingers after it has disappeared from every other part of the body. Sometimes also, in very young infants, gangrene occurs, especially of the genital organs in the male. Several of these cases have been related to me, all under the age of a month or six weeks, and all fatal. Occasionally the sloughing is so great as to denude the testicles. A noteworthy feature of erysipelas in infants is its proneness to return. When it has been progressively subsiding, and hope is entertaine [illegible] isappearance, it not infrequently is suddenly relighted from some unknown cause, travelling again over the same, or parts of the same, surface. In one case the disease, arising from vaccination, extended three times over the arm and forearm; and in another case, a second time over both legs and a considerable part of the trunk.

The internal inflammations, which most frequently complicate erysipelas, and give rise to symptoms which are superadded to those pertaining to the erysipelas, are pharyngitis and peritonitis; and more rarely broncho-pneumonia or enteritis. In a case which I examined after death, in the Nursery and Child's Hospital, and in which the erysipelatous inflammation having extended over the abdomen, the lesions of peritonitis were present, it seemed probable, from the thinness of the abdominal walls, that the inflammation had extended through the parietes from the external to the internal surface.

PROGNOSIS.—Erysipelas is much more fatal in infancy than in adult life. In the death statistics of this city for three years, I find eighty deaths from erysipelas of infants under the age of one year, to eighty-three deaths from this disease above that age. Age greatly influences the prognosis. Infants under the age of three weeks usually die; from the age of three weeks to six months the result is doubtful; while above the age of six months a majority recover with correct treatment. It will be seen by the foregoing table that seven infants under the age of six weeks had erysipelas, and six died; from the age of six weeks to six months, six recovered and nine died; and above the age of six months, nine recovered and four died.

With the exception of a case of the so-called umbilical erysipelas, the youngest child who recovered, of whom I have obtained information, was three weeks old. In this case the rash extended nearly over the entire surface, beginning with the face. Case 38 of the table, treated by myself, was very similar as regards the extent of the erysipelatous eruption and the result. This infant was five weeks old.

It is scarcely necessary to state that erysipelas is more favorable when it affects the limbs than when it invades the head, neck, or body; when it spreads slowly than rapidly; when it is superficial than when phlegmonous. In those cases in which the connective tissue is much involved, the infant is not always safe after the disease has run its course; he sometimes dies exhausted from the discharge of abscesses: I have records of two such cases.

DURATION.—In sixteen cases that recovered, the disease terminated within the first week in two, the second week in six, the third week in five, fourth week in one, and in two cases it lasted five and six weeks. The average duration was fifteen days. In nineteen fatal cases, ten died within the first week, five the second week, three the third week, and one in the fourth week. The average duration of fatal cases was about ten days.

MODES OF DEATH.—Death occurs in different ways; in clonic or tonic convulsions followed by coma, from exhaustion, and from internal inflammation, that from exhaustion being probably the most common.

PATHOLOGICAL ANATOMY.—The blood doubtless in this disease undergoes certain pathological alterations previously to the occurrence of the eruption, but the exact changes are not known. Our knowledge of the morbid anatomy of erysipelas relates chiefly to the local affections, which, with the exception of the inflammation of the skin, are not constant, and may, therefore, be regarded as complications. The cutaneous inflammation affects all the structures of the skin, and in greater or less degree also the subcutaneous connective tissue. The inflammation is accompanied by more or less serous effusion or œdema.

The not infrequent occurrence of peritonitis in connection with erysipelas has long been known. In Heberden's *Epitome Morborum Puerilium*, the anatomical character of erysipelas is expressed in one sentence: "When the body has been opened after death, the intestines have been found glued together and covered with coagulable lymph." Since Heberden's time, nearly all who have written on diseases of infancy and childhood have mentioned peritonitis as one of the most common complications. Underwood says: "Upon examining several bodies after death, the contents of the body have frequently been found glued together and their surface covered with inflammatory exudation, exactly similar to that of women who have died of puerperal fever." Similar remarks in reference to the frequency of peritonitis in this disease are made by recent writers.

The statistics in reference to this disease appear to demonstrate that in infants in hospital practice, and in those affected by erysipelas during epidemics of puerperal fever, peritonitis is a not infrequent complication. On the other hand, as we commonly meet cases of infantile erysipelas occurring sporadically in private practice, there is not sufficient abdominal distension and tenderness for peritoneal inflammation. In only one of the cases embraced in the foregoing table was a post-mortem examination made, and in that there had been no peritonitis. The occurrence of pharyngitis in connection with erysipelas has been already alluded to.

Enteritis has been alluded to as another complication in infants. Diarrhœa has been stated to be a symptom in certain cases; it has been found to be dependent on enteritis of a mild grade. Billard made post-mortem examinations of sixteen cases of infants dying of erysipelas, and "found in two gastro-enteritis, in ten enteritis, in three pneumonia complicated with enteritis and cerebral congestion, and in one pleuro-pneumonia."

TREATMENT.—On this side of the Atlantic great uniformity prevails as regards the treatment of erysipelas. Sustaining measures are prescribed, and the tincture of the chloride of iron is the tonic generally preferred. Whatever the intensity of the febrile reaction and the stage of the disease, if there is no intestinal complication, ferruginous or other tonics should be administered. The largest doses of the tincture of the chloride of iron given in any of the cases in the above table were in case No. 4, namely, ten drops every two hours, and this patient recovered in seven days from a pretty severe attack. Probably, however, nothing is gained by such large doses, and they may irritate the intestinal surface, and increase the liability to enteritis, which, we have seen, complicates a certain proportion of cases. Two drops may be given every three hours to a child from one to two years of age. Instead of the iron, or in addition to it, one of the preparations of cinchona may be prescribed. Beef-tea, and in most cases wine-whey or other alcoholic stimulant, are required.

The depressing measures recommended by certain writers cannot be too strongly censured. Bouchut says: "We should endeavor from the first to allay the inflammation of the skin by energetic treatment. . . . Local abstraction of blood, by means of one or two leeches applied at the circumference of the primary seat of the erysipelas, should be put in force, provided the power of the constitution of the children permits." Such treatment may explain one of Bouchut's aphorisms, namely, *the erysipelas of infants is a fatal disease.*

Local treatment may be employed to arrest the extension of the inflammation, but the result in most cases is not encouraging. Solid nitrate of silver was employed in two cases, of which I have records, and in both the result was pernicious. Troublesome sores were produced, from which blood escaped, and in one of the cases, at least, death was attributed by the parents to this treatment, rather than to the disease.

Tincture of iodine is a better remedy for arresting the extension of erysipelas. It should be applied from the margin of the inflammation, over the sound skin, to the distance of about two inches. It may be ineffectual, but it does not produce any unfavorable result. Soothing applications, like rye flour, or a lotion of sugar of lead, may be made to the inflamed surface, as in erysipelas of the adult. I prefer, however, for local treatment, the constant application of glycerine, or glycerine and water, to which a few drops of carbolic acid are added.

PART III.

SECTION I.

DISEASES OF THE CEREBRO-SPINAL SYSTEM.

DISEASES of the brain and spinal cord are less frequent than those of the respiratory and digestive systems. They are also less amenable to treatment, and are much more fatal. They largely increase the aggregate of deaths. They contrast with the diseases of the other systems in their greater relative frequency in infancy and childhood than in adult life. This is explained, as regards the brain, by the rapid development of this organ in early life, its feeble consistence, its great impressibility by the emotions, and the thinness of the covering which protects it from external agencies.

Some of the most interesting of the cerebro-spinal diseases which are to engage our attention, are peculiar to early life, as tetanus nascentium. The diseases of this system also contrast with other local affections in their greater obscurity, especially in their commencement; for while diseases of the thorax can be readily ascertained by auscultation and percussion, or those of the abdomen by the nature of the evacuations or the degree of tenderness or distension, our means of conducting examination through the bony encasement of the cerebro-spinal axis are meagre and unsatisfactory. The condition of the brain and spinal cord must be determined, chiefly, by the study of symptoms, and not by direct examination. The condition of the anterior fontanelle in young infants, however, enables us to determine the presence or absence of active congestion of the brain. If there is an excess of arterial blood, it is convex. Prominence of the fontanelle is common in inflammatory and febrile diseases, and is a sign of considerable diagnostic and prognostic value.

Within a few years, the ophthalmoscope has been employed as a means of diagnosis in cerebral diseases, and although the employment of this instrument for such purpose is but recent, enough has been elicited to prove its great value as an aid in determining the state of the brain. Prof. H. D. Noyes remarks on this subject: ". . . The argument for making ophthalmoscopic examination in all cases of brain disease, becomes irresistible. Indeed, a moment's reflection would lead to this conclusion without any considerations drawn from pathology. The optic nerve is only an outlying portion of the brain; its extremity is fully exposed to view. Situated within about two inches of the brain, it is the only nerve in the body which we can inspect; it contains bloodvessels which communicate directly with the intra-cranial circulation. We thus come into relation with the cerebrum, by continuity of nerve-structure and also of bloodvessels."

Structural changes in the optic nerve and retina have been discovered by means of the ophthalmoscope in meningitis, hydrocephalus, phlebitis of the sinuses, apoplexy, etc. Among the lesions which have been observed by this instrument, are hyperæmia, more or less opacity and tumefaction of the optic nerve, engorgement of the vessels of the retina, with serous or serofibrinous exudation and ecchymotic points. In certain protracted diseases, as chronic hydrocephalus, in which dimness or loss of sight occurs, the ophthalmoscope discloses a state of atrophy of the optic nerve. Heretofore the ophthalmoscope has been chiefly employed by oculists, but as it comes into more general use, there can be little doubt that it will be recognized as an important aid in the diagnosis of obscure cerebral diseases.

Still, with all possible aids to diagnosis, the obscurity which attends the invasion of many of the cerebro-spinal diseases must be acknowledged. To the hasty and careless physician, their symptoms are often deceptive. Careful weighing of the phenomena, and thorough and protracted examination, are requisite in order to insure correct diagnosis and proper treatment. Some of the cerebro-spinal affections are, in reality, sequelæ of other diseases, as, for example, spurious hydrocephalus; and some are, strictly speaking, only symptoms, as convulsions; but, on account of their importance, and because they require special treatment, it is proper to consider them as diseases *per se*.

The brain presents certain peculiarities in infancy and childhood. In the fœtus, while the other organs are well formed, the brain, especially its cerebral portion, is still diffluent, and at birth it has so little consistence that it must be handled carefully to prevent laceration. This softness is due to the large proportion of water which it contains. The following analyses show the composition of the brain in the three periods of life:—

	Infant.	Youth.	Adult.
Albumen	7.00	10.20	9.40
Cerebral fats	3.45	5.30	6.10
Phosphorus	.80	1.65	1.80
Osmazone, salts	5.96	8.59	10.19
Water	82.79	74.26	72.51

At birth the brain has a nearly uniform white color. The gray substance, in which the nervous power originates, is undeveloped. The date of its appearance corresponds with the first exhibition of emotion or intelligence, and the decided gray color which we observe in the brain of the adult does not appear until the age of full mental activity.

In the new-born the brain is large in proportion to the rest of the body, and its growth during infancy and childhood is rapid. Until the fifth year, as appears from the observations of Dr. Peacock, its weight is about one-seventh or one-eighth that of the entire system, the proportions varying somewhat in different cases.

The brain does not attain its full size, as stated by Dr. West, at the age of seven years, but, according to Dr. Peacock's statistics, it continues to increase till the age of twenty-five or thirty, although its growth is less rapid after the age of seven years than previously.

The membranous covering of the cerebro-spinal axis is scarcely less interesting to the pathologist than the axis itself. I shall speak in the following pages of the arachnoid and cavity of the arachnoid, for convenience of description, although aware of the fact that some eminent authorities, as Virchow and Kölliker, whose opinions in reference to the minute anatomy of the system always command attention, if not assent, believe that there is no arachnoid, but what has heretofore been called by this name is on the one side the smooth surface of the dura mater, and on the other of the pia mater.

The dura mater is seldom involved in the diseases of early life, except as it is affected by pressure, while the pia mater and arachnoid are the seat and source of some of the most important diseases, as meningitis, meningeal apoplexy, etc.

The more complicated and delicate the structure of an organ, the more liable it is to errors of nutrition and growth. There is, therefore, no organ which is so liable to irregular development as the brain. It may be entirely wanting; or it may be partially developed, certain portions being absent; or, lastly, its growth may be excessive, constituting a true hypertrophy.

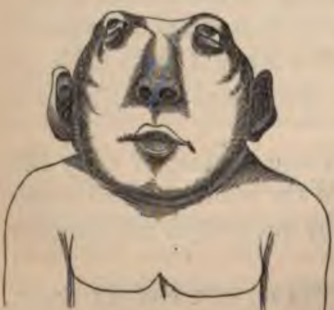
CHAPTER I.

ACEPHALUS—ANENCEPHALUS.

Entire absence of the encephalon is not common, but there are many cases of this monstrosity on record. In extreme cases the head and part of the neck, as well as the brain and medulla oblongata, are absent. When there is great deficiency, there is often a twin, the presence of which has interfered with the full development of the system. Sometimes the growth of other organs besides the brain is imperfect.

Anatomical Character.—In the ordinary form of anencephalus, the brain and sometimes the medulla are absent, with the absence or imperfect development of their membranous and osseous covering. The vault of the cranium is absent. There is deficiency of the frontal, parietal, and occipital bones, except those portions which are near the base of the cranium. These portions are very thick and closely united, as if there were the usual amount of osseous substance, but instead of expanding into the arch, it had collected in an irregular mass at the base of the cranium.

The absence of the brain and the cranial arch gives a remarkable appearance. The eyes are prominent, the neck thick and short, while the body and limbs are ordinarily well developed. The physiognomy has been compared to that of some of the lower animals.



The base of the cranium is often occupied by a vascular tumor, not large, but of different size in different cases, and continuous below with the spinal pia mater. This vascular tumor is the representative of the cranial pia mater, and its smooth surface is

The dura mater and the scalp b
sembles very much in appear
centa, and the sensation wh

it is very similar. Sometimes small portions of cerebral matter are found among the vessels of this tumor, but they are so disconnected or isolated that they do not perform, in any way, the function of a brain. Occasionally the vascular tumor is absent, and the medulla or upper extremity of the spine is exposed, or it terminates in a little papilla at the back of the neck.

Those portions of the cranial nerves which lie external to the cranium are well developed, although the intra-cranial parts may be absent.

SYMPTOMS.—The respiration in anencephalous monsters is irregular. They can be made to cry, but their cry is a sort of sob or hiccup, and, occasionally, they even nurse. The digestive function is well performed, and regular urinary and fecal evacuations occur. There is a tendency in anencephalous monsters to convulsions. Blowing upon them, and pressure upon the projecting medulla, if this is present, frequently produce this effect.

PROGNOSIS.—Fortunately these monsters are short-lived. If the medulla oblongata, which is essential to the maintenance of respiration, is absent, extra-uterine life is impossible. Stillbirth is the result. If the medulla oblongata is present, although respiration and circulation are established, death commonly takes place within two or three days, and almost always within the first week. Convulsions sooner or later occur, ending in fatal coma.

CHAPTER II.

IMPERFECT BRAIN.

BETWEEN the absent and complete brain there are various grades of deficiency. Parts of the brain may be perfect, while other portions are either absent or imperfectly formed. The deficiency is usually in the superior parts of the brain, especially in the hemispheres of the cerebrum, while the base of the organ is perfect. Both hemispheres may be absent, or one may be absent, while the other hemisphere is shrivelled or rudimentary. Occasionally the cranium preserves its normal shape and size, in consequence of an increase in the cerebro-spinal fluid proportionate to the lack of brain-substance. The imperfect development is not then apparent to the observer. The rudimentary hemispheres in these cases are spread out, forming the walls of a sac inclosing the liquid. The post-mortem examination of the following case was made in the Nursery and Child's Hospital, of this city, in 1862.

CASE.—Female; parentage healthy; she was plump and well formed at birth, and nothing unusual was observed in her condition, as she nursed and throve like other children, till she reached the age when there is, usually, the first manifestation of intelligence. With her there was no evidence of an intellect, or if any, it was very indistinct. She nursed, or took food when placed in her mouth, but apparently without relish, as if instinctively. She never reached her hands towards the nurse, or towards playthings. So indifferent and apparently unconscious was she of objects around her, that it was thought for some time that she was blind. She never smiled, except when her hands were gently rubbed or shaken; and then the smile seemed to be more a reflex movement than emotional. The smile was immediately succeeded by a fixed vacant look. She usually lay quietly, with her arms crossed; and during the last months of her life she sometimes uttered a scream, like children with cerebral diseases. Her evacuations were regular, and she was not subject to vomiting, before she was attacked with the acute disease of which she died. The size of her head was rather less than usual at her age, but not less than is often seen in well-formed children. The forehead was small in proportion to the rest of the head, but the difference was not such as to attract attention. Fortunately, the existence of this idiot was terminated by an attack of entero-colitis.

Sectio Cadav.—The head was measured, but the measurements were lost. They did not seem to differ materially from the normal standard. The sutures were united, and the fontanelles nearly, if not quite, closed. The frontal bone lay a little lower than the plane of the parietal. The meninges of the brain presented nearly their normal appearance, but were distended with transparent serum. The quantity of fluid was estimated at about two-thirds of a pint, and when it was evacuated, the floor of the lateral ventricles was brought into view. There was almost an entire absence of that part of the brain which lies above the floor of the ventricles. On close inspection, rudimentary cerebral hemispheres were found in a thin layer forming a part of the walls of the sac. The whole amount of brain-substance above the ventricles did not exceed the size of a small egg. The cerebellum, the base of the brain, and cranial nerves presented their usual appearance. The entire brain, after being a few days in diluted alcohol, weighed six and a quarter ounces.

In this case, the fluid was only sufficient to compensate for the deficiency of the brain. In other, and probably the larger number of cases of incomplete brain, the cerebro-spinal fluid is not materially increased. There is then but slight elevation of the frontal bone, the forehead is low, or retreating, or even almost absent. This is that shape of head which is universally regarded as characteristic of idiocy.

SYMPTOMS.—The symptoms in cases of deficient brain relate to the mind. If the cerebral hemispheres are absent, there is no intelligence. The individual, as regards mental endowments, does not rise above the instincts of the lower animals. If the hemispheres are partially developed, there is a degree of intelligence proportionate to the amount of cerebral substance present. If the deficiency is confined to one side, there is no apparent lack of intelligence or mental capacity, since, the brain being a double organ, one side performs the function of both.

PROGNOSIS.—The prognosis as regards life, in cases of imperfect brain, depends not so much on the amount of deficiency as the exact seat of arrested growth. If only the cerebrum is partially, or even entirely absent, the infant may live and thrive. But if those portions lying at the base of the brain, which control the functions of animal life, are lacking, or are imperfectly formed, life is very uncertain, and probably short.

It is evident that no therapeutic treatment can remedy a congenital deficiency. The services of the physician are not required. The philanthropic and patient teacher may impart a degree of intelligence to the idiotic, and the instruction of these unfortunates has of late years been very successful.

Microcephalus—Atrophy of Brain.

An abnormally small brain, or microcephalus, as it is termed, sometimes results from premature closing of the sutures and fontanelles. If ossification is so rapid that the cranial bones are firmly united, and are of such thickness as to be unyielding at the time when the growth of the brain is most active, the full development of this organ is necessarily prevented. The brain is compressed, its convolutions flattened, and the functions of the organ are imperfectly performed. Death, sooner or later, is the common result; life ends in convulsions and coma.

Again, the brain of the child, when undergoing development, with the cranial bones sufficiently yielding, may not only cease to grow, but may even diminish in size, in consequence of protracted and exhausting diseases. Diminution in the size of the brain occurs especially after fevers and diarrhœal affections of long standing and attended with much emaciation. The waste of the brain corresponds with the general loss of flesh. If the cranial sutures are not united, the occipital and sometimes the frontal bones are depressed, according to the diminished size of the brain, and are overlaid by the parietal. In foundlings of two or three months, this loss of brain-substance is often very striking. In infants of this class who have died of protracted diarrhœa, it is not unusual to observe the occipital bone not only depressed, but extending one, two, or even three lines underneath the parietal.

If the child with shrunken brain, from protracted and exhaustive disease, is old enough to express its thoughts, it often seems foolish, talks but little, and perhaps says the same thing over and over again. In one case in my practice, a litle girl, having passed through a long course of typhus, persistently repeated during her convalescence, with a silly smile, the questions addressed to her. This peculiarity continued two or three weeks, although her appetite was good, and her restoration to health rapid. In another case a little boy, during convalescence, was wont to laugh heartily at the appearance of the ordinary articles of furniture in the room. Both showed more derangement of mind during convalescence than in the midst of the fever. The friends of such children are in a state of great anxiety lest their minds are permanently impaired, but, as the appetite and strength return, the nutrition of the brain is re-established, and the mind regains its former vigor. In cases of wasted brain, with cranial bones united, the deficiency is supplied by serous effusion, which is gradually absorbed as the health of the patient is re-established, and the brain enlarges. This effusion occurs not only over the convexity of the brain, but also at its base, and sometimes in the ventricles. Dr. West states that in atrophy of the brain, from protracted disease, its texture is firmer than usual. I have not noticed this in infants, but my attention has not been directed particularly to this point. It is probable that there is some change in the anatomical character of the brain, aside from mere waste.

Partial atrophy of the brain sometimes, also, occurs from primary disease located in this organ; the affected portion wastes, while the rest retains its normal development.

CHAPTER III.

HYPERTROPHY OF BRAIN.

In contrast with atrophy of the brain is the opposite state, or hypertrophy. The size of this organ within the limits of health varies greatly in different individuals, but sometimes there is so great an increase in volume as to properly constitute a disease.

PATHOLOGICAL ANATOMY.—The excess of growth which characterizes this disease has been ascertained to be confined to the white portion of the brain, and ordinarily to that part contained in the cerebral hemispheres. Hypertrophy of the brain is attended by induration, which exists in different degrees in different cases. It is in some so slight as to be scarcely appreciable; while in others it is apparent at once by pressure with the finger, or incision with the scalpel. Rilliet and Barthez state that the induration in some cases resembles in degree and appearance that produced by the action of alcohol. The white substance of the cerebrum is not only resisting and elastic, but its color is unusually pale; it presents even a brilliant or polished appearance. At the same time the gray substance is more or less faded, and its depth in the convolutions is less than in the normal state of the organ. Rokitansky says: "The cineritious matter is generally of a pale grayish-red color. The medullary is always dazzling white, and remarkably pale and anæmic." An unusual case is related by Burnet, in which the gray substance in the corpora striata retained its usual color, and was indurated like the white substance. In exceptional cases the cerebellum as well as cerebrum undergoes hypertrophy, becoming at the same time more or less indurated. In Burnet's case there was induration of the optic nerves. "The internal structure," he says, "of the optic nerves, especially in their bulbs, had the polish, homogeneous appearance, elasticity, and almost the hardness of cartilage." Rilliet and Barthez state that in two cases the spinal cord presented even more marked induration than the encephalon. Congestion is not a feature of hypertrophy. On the other hand, there is often less vascularity of the brain and its membranes than in the healthy state. If the cranial bones are completely ossified at the time when hypertrophy commences, and firmly united, enlargement of the brain is partially prevented. The convolutions are then thin, much flattened, the sulci more or less effaced, the membranes pale and dry, and the ventricles are small and nearly destitute of serum. At the autopsy of such a case, when the dura mater is incised, the expansion of the brain prevents the proper refitting of the skullcap. Occasionally hypertrophy causes more or less absorption of the cranium, and perhaps the sutures already united are pressed apart.

If hypertrophy commences in young infants with the fontanelles and sutures still open, they usually remain open, or are a long time in uniting. The interspaces continue, not only in consequence of the growth of the brain, which tends to separate the bones, but also in consequence of feeble ossification. The shape of the head arrests attention. Hypertrophy usually produces most enlargement between and above the ears, while the frontal portion of the head, though somewhat enlarged, is less developed.

The direction of the eyes is not changed, as is common in congenital hydrocephalus.

Rokitansky says (vol. iii. page 285): "With regard to the question to be decided by the theory and microscopic examination, as to the nature of the added material upon which the increase of volume depends, I have formed the following opinion from repeated investigations:—

"1. The disease is genuine hypertrophy.

"2. It consists, as such, not in an increase in the number of nerve-tubes in the brain, from new ones being formed, nor in an increase in the dimensions of those which already exist, either as thickening of their sheaths, or as augmentation of their contents, by either of which the nerve-tubes would become more bulky; but,

"3. It is an excessive accumulation of the intervening and connecting nucleated substance."

It is now generally admitted that the views of Rokitansky are correct, that hypertrophy of the brain is due to an augmentation in the amount of connective tissue, which lies between and unites the tubules.

CAUSES.—Hypertrophy of the brain is commonly associated with rachitis or scrofula, or some error in the nutritive process, which shows itself in other parts of the system as well as the brain. Rilliet and Barthez consider frequent congestion of the brain as a common cause of hypertrophy. This disease is not common in this country. It is most frequently met in hospitals for children, and among the poor of the cities, whose systems are rendered cachectic by residence in damp and dark localities, and by unwholesome diet. In the deep valleys of Switzerland, and in parts of South America and Asia, hypertrophy of the brain is common, under the name cretinism. It is associated with rachitis and stunted growth. The abnormal development which occurs in cretinism begins in infancy or early childhood, and the unfortunate subjects of it are short-lived. Cretinism has been attributed to a residence in localities wet and deprived in great measure of solar light, and to general disregard of the laws of health on the part of those affected as well as their parents. A recent thorough examination of the subject lends support to the caused by the use of water containing one of the combinations of sulphur and iron.

The observations of different physicians also establish a connection between some cases of hypertrophy and the saturation of the system by lead. In what way lead-poisoning leads to hypertrophy is obscure, but the concurrent testimony of different observers is so strong, that we cannot doubt that it does sometimes have that effect.

SYMPTOMS.—The symptoms, as is the case with most organic diseases of the brain, vary considerably in different cases. Sometimes there is, at first, more or less depression or languor. If the child is old enough to speak, he may complain of pain in the abdomen or limbs, evidently neuralgic, or of headache. After a variable time vomiting succeeds, and finally convulsions, affecting the muscles of the face, as well as extremities; the convulsions are usually clonic, but sometimes, as regards at least the extremities, of a tonic character. The pupils may be contracted or dilated; there is restlessness alternating with drowsiness, and finally coma succeeds.

Hypertrophy may continue a considerable time before serious symptoms arise; but when once developed, these symptoms ordinarily continue with more or less severity till death. Death commonly results within a week after their commencement, but sometimes not till several weeks have elapsed. When death occurs at an early period in the disease, there is usually firm ossification and union of the cranial bones, and, therefore, but moderate enlargement of the cranium.

If hypertrophy commences at a period not far removed from birth, the bones, of course, yield more readily to the pressure, and acute symptoms do not occur so soon. After a time, however, in all or nearly all cases, convulsions supervene. These indicate the gravity of the disease, and are prognostic of its fatal termination.

In a patient observed by Burnet, violent convulsions, followed by loss of consciousness, marked the commencement of acute symptoms. Five days subsequently, the following symptoms were recorded: mobility of the eyes, without expression; pupils contracted, and directed upwards; divergent strabismus of the left eye; the senses in their normal state, with the exception of sight; the limbs move by volition. For a month there was little change. Then occurred drowsiness, and increased prostration, and five weeks later the child succumbed with the symptoms of double pneumonia.

Such is the clinical history of hypertrophy. In cases of firm ossification of the cranial bones, and, therefore, no marked enlargement of the skull, the symptoms are similar to those which occur if the dimensions of the head are increased, only compression and death result sooner.

The following case, in which the sutures were firmly united, I attended in 1864. The head was large, but not so large as to attract attention from its disproportion.

CASE.—A boy, aged two years and two months, had, when about one year old, fever and ague, and since then his countenance was uniformly pallid, and his flesh soft. Weaned at the usual time, he remained well till the first of January, 1864. In the beginning of this month he was observed to be feverish for some days, and his appetite poor. His health then gradually improved, and he was thought to be entirely well.

On the 26th of February he was suddenly seized with convulsions, general at first, but most severe and continuing longest on the left side. The convulsions lasted a little more than three hours. He recovered fully his consciousness by the following day, but his appetite remained poor; he was no longer amused by his playthings, and was very fretful. The surface was pallid; bowels constipated; pulse but little, perhaps not at all, accelerated. He continued in this state till the 6th of March, when he had another slight convulsive attack, and from this time he never fully recovered his consciousness. He was fretful if disturbed, his face generally pallid, while the pulse and respiration were not perceptibly altered.

On the following day, the 7th, the left pupil was somewhat larger than the right, but both were sensitive to light. The difference in size continued till near the close of life. Although vision was imperfect, if not altogether lost, the sense of hearing was not impaired.

When questioned, he uniformly answered "No," with a drawling voice, evidently not understanding what he said.

As the disease advanced, the respiration became at times sighing; but the rhythm of the pulse was not materially altered. The temperature of the surface was changeable, sometimes cool, sometimes warm, and the congested spots or patches, so common in cerebral affections, were also observed at times on the face, ears, or forehead. Through most of his sickness, he took drinks readily, and the urine was freely discharged, probably from the iodide of potassium, which he took in one and a half grain doses every two hours.

He became more and more drowsy, again had slight convulsive movements, and finally died, with much apparent suffering, on the 14th of March. The pulse became more accelerated during the last two or three days. On the day preceding his death, the pupils were contracted, and not affected by the light.

Sectio Cadav.—Body somewhat emaciated, and eyes sunken; occipito-frontal circumference of head nineteen and a half inches; distance from one auditory meatus to the other over the vertex, thirteen and a half inches; convolutions over the surface of the brain much flattened and compressed; brain generally deficient in blo [illegible]
firm, and of a pure white color; menin [illegible]
appearances were observed; weight o [illegible]

DIAGNOSIS.—The diagnosis of hypertrophy is not always easy. The symptoms are, in the main, such as occur in other pathological states, especially congenital hydrocephalus. There is most danger of mistaking the overgrowth for this disease. Hypertrophy has, indeed, often been treated for hydrocephalus. There are, however, certain signs by which we may distinguish one from the other. In the ordinary form of congenital hydrocephalus, even when the amount of liquid is small, the orbital plates of the frontal bones are pressed in such a way that the axis of the eyes is changed so as to have a downward direction. The white of the eye can be seen between the iris and the upper eyelid. This gives a characteristic and striking expression to the face. The exception to this is in those rare cases in which the liquid is external to the brain. In hypertrophy this peculiar change in the axis of the eyes does not occur. Moreover, in hypertrophy there is not that uniform expansion of the head which is observed in hydrocephalus, as has been stated above. There are, commonly, greater enlargement, more prominence of the anterior fontanelle, and wider separation of the cranial bones, in hydrocephalus than in hypertrophy.

Hypertrophy with consolidation of the cranial bones, and, therefore, little enlargement of the head, may be mistaken for meningitis. The history of the case, and the means by which we diagnosticate the latter affection, which will be described in their proper place, will usually enable the physician to make a correct diagnosis.

PROGNOSIS.—In forming an opinion as to the probable termination of the disease, we must have regard to the age and general condition of the child, as well as to the degree of hypertrophy. If the disease commence at an early age, when the cranial bones are not firmly united, it is probable that there will be no compression of the brain, so as to endanger life, for a considerable period. We may then hope by proper measures to remove the constitutional state which gives rise to the hypertrophy, before the enlargement is such as to cause cerebral symptoms. If the bones have already united when the disease commences, even slight hypertrophy will produce symptoms, and a speedily fatal result is inevitable. Evidently, also, a child in a marked degree rachitic or scrofulous is much less likely to recover than one whose general health and constitution are less impaired.

TREATMENT.—The treatment in hypertrophy should be directed mainly to the constitution. Measures calculated to improve the nutritive process are those most likely to check the abnormal growth of the brain. As the disease is one of perverted nutrition, and usually coexists with a vitiated or impoverished state of the blood, tonic and alterative remedies are required. The liquor ferri iodidi is, therefore, useful, as it is both tonic and alterative. This may be given in doses of three or four drops to a child one year old, three times daily. Cod-liver oil, with or without the iron, is beneficial in some cases. Another remedy is iodide of potassium in combination with a tonic, as the compound tincture of bark.

℞. Potas. iodid. ʒj;
Tinct. cinchon comp.,
Syr. limonum, āā ℥ij. Misce.
One teaspoonful, three times daily, to a child of three years.

The hygienic treatment is not less important than the medicinal. There is little hope of a favorable issue in any case, unless the regimen is such as will conduce to a more robust and healthy state of system. The diet should be plain and nutritious, the apartments clean and airy, and all undue excitement should be avoided.

CHAPTER IV.

THROMBOSIS IN THE CRANIAL SINUSES (PHLEBITIS).

The formation of fibrinous coagula within a vein or sinus is designated thrombosis (*thrombus*, clot). Coagulation of fibrin in the cranial sinuses occasionally occurs, constituting a very serious pathological state. This may result from local disease in the sinuses or in their vicinity, or from disease external to the cranium. The immediate cause of thrombosis, whatever its location, is sufficient arrest of the circulation to allow the fibrin to coagulate.

Tubercular and enlarged bronchial glands, compressing more or less the venæ innominatæ or the descending vena cava, sometimes give rise to thrombosis in the cranial sinuses, the fibrin coagulating in consequence of retardation in the current of blood. I have known thrombosis, in the same situation, also to result from clonic convulsions, occurring in connection with [illegible] in pertussis, since both the cough an

of blood in the veins and sinuses

post-mortem examination of two such cases I found firm whitish clots in the lateral sinuses.

Thrombosis, in the cranial sinuses, may also occur from inflammation either in the walls of the sinuses, or immediately exterior to them. This is the disease which writers have designated phlebitis of the cranial sinuses, and for a correct understanding of the morbid anatomy of which the profession are indebted to Virchow.

Anatomical Characters.—If a child die with the cranial sinuses and the veins of the brain and of the meninges in their normal state, the blood in these vessels is found at the autopsy dark but liquid, or there are small, dark, and soft clots in the larger sinuses. If there was congestion, but no coagulation, in these vessels in the last hours of life, the clots are more numerous, larger, and longer, sometimes extending from the sinuses into the larger veins which empty into them, but they are still dark and soft, readily falling to pieces when handled. If, again, there has been that degree of congestion and stasis which has resulted in ante-mortem coagulation, or in thrombosis, the clots are, in part at least, whitish, and of a fibrinous or gelatinous appearance; they were formed while the red corpuscles were still carried along in the circulation.

Most of the clots in thrombosis are free, while others are attached lightly to the internal surface of the sinus; occasionally they are so large as to distend the vessel. They extend also in many cases into the cerebral veins which connect with the sinuses, producing prominence and firmness, so as to resemble (Rilliet and Barthez) an artificial injection. The clots do not present a uniform character. In parts of a sinus they consist of almost pure fibrin, of a yellowish-white color, while in other portions they present a gelatinous appearance from the large number of white corpuscles, while other portions are more or less tinged from the presence of red corpuscles. The central part of the clot, after a time, if the case is sufficiently protracted, softens, and presents a puriform appearance. This substance, which is only disintegrated fibrin, was supposed to be pus, till the microscope revealed its true character. It is obvious that small clots forming within a sinus, and having no attachment to its walls, are liable to be carried by the current of blood into the general circulation, unless there is complete obstruction. Virchow has also shown how a thrombus may extend, by gradual prolongation, nearer and nearer the heart, so that one commencing in a sinus may, after a time, reach into the jugular vein. Different observers, as M. Tonnelé, and also Rilliet and Barthez, have traced the fibrinous masses as far as the cava. The latter writers relate the case of a girl, four and a half years old, in whom the sinuses on the left side, especially those nearest the petrous portion of the temporal bone, were completely filled with clots of a yellowish-white color, intermixed with central dark spots. Similar coagula were also found in the left jugular vein as far as the brachio-cephalic trunk. Whether the walls of the sinus undergo any change depends on the nature of the disease which causes the thrombosis. If it be phlebitis, the coats are thickened from infiltration and injected, and the internal coat has lost its polish. If it be some obstructive disease in the course of the circulation, or a general cause, the coats of the vessel are unaltered, except that they may be stained by imbibition of the coloring matter of the blood. In an infant who died of this disease in the practice of Dr. West, "the sinuses on the left side were healthy, but the blood was almost entirely coagulated. The posterior half of the longitudinal sinus, the torcular, the left lateral, and the left occipital sinuses, were blocked up with fibrinous coagulum, precisely such as one sees in inflamed veins, and the clot extended into the internal jugular vein. The coats of the longitudinal, and of the inner half of the lateral sinus, were much thickened, and their lining membrane had lost its polish, was uneven, and presented a dirty appearance."

The mode in which congestion and coagulation occur within a sinus, in consequence of the pressure of a tumor upon this vessel, or upon a vein into which the blood from this sinus flows, is sufficiently obvious. The mode of the production of thrombosis, as a result of clonic convulsions, or of the spasmodic cough of pertussis, is also apparent. How it results from inflammation of the walls of a sinus, that is, from phlebitis, was not understood till explained by Virchow.

The fibrinous coagula which fill the sinus are not an exudative product, as was formerly supposed. Inflammation (in most cases otitis, with caries of the petrous portion of the temporal bone) approaches a sinus. The inflammatory products pressing against the walls of the sinus diminish its calibre at that point, and hence the retardation of the current of blood and the coagulation. Or the walls of the sinus may be thickened by inflammatory infiltration, or even by the formation of little abs
in consequence of the inflammat
inwards, and the result, as re

Whether, therefore, the inflammation occur without a sinus, or within its walls, thrombosis equally results, provided that the diameter of the vessel is sufficiently narrowed by the presence and pressure of inflammatory products.

There is no exudation on the internal surface of a sinus or vein when inflamed, as there is upon serous surfaces. "On the contrary" (*Cellular Pathology*, translation, p. 236), "when the wall is inflamed, the exuded matter (exsudatmasse) passes into the wall, which becomes thicker, cloudy, and subsequently begins to suppurate. Nay, even abscesses may form which cause the wall to bulge on both sides like a variolous pustule, without any coagulation of the blood ensuing in the cavity of the vessel. At other times, certainly, phlebitis, properly so called (and in like manner arteritis and endocarditis), is the cause of thrombosis, in consequence of the formation of inequalities, elevations, depressions, and even ulcerations upon the inner wall which favor the production of the thrombus. Still, whenever phlebitis, in the usual sense of the word, takes place, the alteration in the coat of the vessel is almost always a secondary one, and, indeed, occurs at a comparatively late period."

This view of the pathology of thrombosis comports with facts observed at autopsies, and which cannot be explained according to the old theory of phlebitis, namely, smoothness of the internal surface of the sinus; natural color of this sinus, or simple staining from blood; the non-attachment or slight attachment of the coagula, etc.

CAUSES.—Some of these have been already stated at the commencement of this article. It is evident from what has been said that this disease may be produced by any cause which obstructs the return circulation from the head. I have already alluded to tumors which press upon the sinus, or on the vein below the sinus, as a cause. Among the causes may be mentioned also abdominal tumors, narrowing of the chest from rachitis, or caries of the vertebræ, and, finally, compression of the jugular vein by a retropharyngeal abscess.

Sufficient allusion has already been made to inflammation of the internal ear as a not infrequent cause. Thrombosis is, indeed, the most dangerous result of chronic otitis. Another cause is a reduced or cachectic state of system, apart from any local obstructive disease. It is a noteworthy fact that a large proportion of those affected with thrombosis, even when it is immediately due to obstructive disease, are cachectic. The explanation of this fact is not difficult. In reduced states of the system the action of the heart is feeble, and passive congestion of the vessels within the cranium is apt to occur. Passive congestion of the veins and sinuses in protracted diarrhœal maladies, which is described in our remarks upon another disease, is an example in point. In this state of feeble circulation very slight obstructive disease may be sufficient to cause thrombosis.

SYMPTOMS.—The symptoms of this disease are often obscure. All of them may and do occur in other diseases of the encephalon. In cases related by M. Tonnelé, cerebral symptoms were well marked, such as faintness, dilation of the pupils, strabismus, grinding the teeth, convulsive movements. There may be an almost total absence of such symptoms as would direct attention to the state of the head. This is due to the sudden occurrence of death in such cases after the clots have formed. If the clots are large, death soon results in consequence of congestion of the brain and meninges, which is proportionate to the amount of obstruction. Extravasations of blood and transudation of serum not infrequently accompany the congestion and hasten the result.

Dr. West relates the case of a girl who had a mild attack of scarlet fever at the age of eight months, and did not fully recover her health. She continued restless and feverish, and had two violent convulsions two weeks after the scarlatina. In the following months she had anasarca, and when she was nearly a year old another attack of convulsions occurred. Fluctuation was now observed in the abdomen, and in a few days a sero-purulent fluid began to escape from the umbilicus. When this discharge had continued eleven days, symptoms of a liquid in the right pleural cavity were suddenly developed. She grew weak and emaciated, and finally was seized with extreme faintness, with which she died in forty-eight hours, at the age of thirteen and a half months.

At the post-mortem examination a large amount of pus was found in the abdominal and right pleural cavities. On the right side of the cranium the sinuses, were filled with coagula, and their coats seemed healthy. The left lateral and occipital sinuses, the torcular and part of the longitudinal sinus, also contained coagula, which extended into the jugular vein. The walls of the longitudinal sinus and the internal part of the lateral sinus were thickened, and their inner surface had lost its polish and was uneven. There was congestion of the brain, with points of extravasated blood. If, as is probable, the convulsions were due to some
cause, the only symptom which was

bosis was the sudden faintness. In the two cases of thrombosis occurring in pertussis, already alluded to, and in which I was enabled to ascertain by post-mortem examination the presence and extent of the clots, the symptoms, which were apparently due to the thrombosis, were those of cerebral congestion. Among these symptoms, stupor, and finally coma, were prominent. The convulsions which occurred in both cases were apparently a cause, and not result, of the thrombosis.

DIAGNOSIS.—It is evident, from what has been said, that thrombosis of the cranial sinuses can rarely be diagnosticated with certainty. The pre-existence of otitis will sometimes lead us to suspect its presence, especially if the otitis has been accompanied by deep-seated pains. Symptoms of cerebral congestion, serous effusion, or apoplexy, occurring in connection with otitis, protracted convulsions, or glandular or other tumors situated so as to compress the vessels which return blood from the brain, indicate thrombosis.

PROGNOSIS.—The prognosis, in any case, is obviously unfavorable. The cause is, ordinarily, permanent, or not readily removed, so that the clots gradually increase. If the cause is local obstructive disease, death is almost certain, since, in nearly every instance, the obstruction is of such a nature that it cannot be removed by medical or surgical treatment. It is possible that recovery may take place if the clots are few and small, and the cause of the thrombosis is mainly feebleness of circulation in consequence of a state of debility. We know that clots may liquefy, and their elements re-enter the circulation; but such a result of thrombosis in a cranial sinus, if it ever occurs, is rare. The thrombus, by its presence, serves as a point of attachment around which more fibrin coagulates, so that the obstruction gradually increases till death occurs.

TREATMENT.—Thrombosis should be treated by cool applications to the head, in order to diminish the congestion, by stimulants and sustaining measures in case the systolic movement of the heart is feeble. Tonics, vegetable or ferruginous, are indicated if there is a cachectic state.

CHAPTER V.

CONGESTION OF BRAIN.

Congestion of the brain is not peculiar to infancy and childhood, but is much more common in these periods of life than subsequently. This is due, in a great measure, to the fact that in the young the circulation is more readily disturbed by moral as well as physical causes than in the adult.

Congestion of the brain is occasionally primary; more frequently it occurs as a concomitant or sequel of some other affection. Diseases, whether constitutional or local, which in the adult have no appreciable effect on the vascularity of the brain, often cause in the child a decided increase of blood in this organ.

Causes.—Cerebral congestion is of two kinds, active and passive. The former results from a cause which directly affects the brain, and increases the flow of blood towards it, or from a cause operating primarily on the heart, and increasing the frequency and force of its systolic movement; the latter is due to some obstruction in the course of the circulation, or to a feeble propelling power on the part of the heart.

Among the causes which most frequently produce active congestion of the brain in the child, may be mentioned blows or falls on the head, excessive fatigue or excitement, heat, perhaps sometimes dentition, and also various inflammatory and febrile affections, especially in their first stages.

Cerebral symptoms occurring in the course of an essential fever are no doubt often due, in a great measure, to the irritating effect on the brain of the specific principle, whatever it may be, circulating in the blood. Occurring in inflammatory diseases which are located elsewhere than within the cranium, they are often attributed to functional disturbance of the brain. The brain, it is said, sympathizes with the affected part through the system of nerves which unite them. But observations show that symptoms referable to the brain, arising in the com[illegible]tial fevers and of the phlegmasiæ, [illegible] by, and are therefore, doubtless, [illegible] on, hyperæmia of this organ.

Difficult as it is to ascertain the state of the brain in many diseases in which it is involved, we may determine whether or not there is congestion in the young child by observing the anterior fontanelle. If it be elevated and tense in an acute disease, hyperæmia is indicated. Now, it is often unusually prominent in fevers and inflammations, especially in their first stages, when cerebral symptoms are present. Its elevation, under such circumstances, is obviously coincident with cerebral congestion.

The acute inflammations which are most likely to be attended by cerebral congestion are those of the mucous surfaces, and pneumonia. Severe coryza, tracheo-bronchitis, entero-colitis, and colitis, commencing suddenly with great febrile excitement, are frequently accompanied in their initial stage by active congestion of the cerebral vessels. Cases like the following, which I find in my note-book, are not infrequent. An infant four months old had been sick about two days with coryza and bronchitis, when I was called to see it; the pulse numbered 156; respiration 64; nursed, and was somewhat restless; cough frequent and dry; bowels moderately relaxed. The mucous membrane of the fauces was injected, and coarse mucous râles were present in the chest. The anterior fontanelle rose above the level of the cranium, and pulsated forcibly. Soon after, convulsions occurred, which were relieved by appropriate measures, and on the following day the fontanelle had subsided. The patient gradually recovered without any other untoward symptom.

Cerebral congestion and convulsions often mark the initial stage of active intestinal phlegmasiæ. This is especially true of dysentery. The little patient, perhaps from the very inception of the colitis, is drowsy; its surface hot; pulse full and rapid. There is sudden and momentary starting or twitching of the limbs. The anterior fontanelle, if still open, is elevated, and it is not till the lapse of several hours that the cause of these symptoms is apparent from the bloody stools.

The causes of passive congestion of the brain are very different from those of the active form. A common cause is obstructions in a sinus or vein by a fibrinous concretion, or by a tumor or abscess external to it.

occasionally met cases in which this form of cerebral
eared to be plainly referable to obstruction to the
from the brain by the pressure of bronchial glands,
plasia in tubercular disease, these bodies dimin-

ishing by external pressure the calibre of the venæ innominatæ or the descending vena cava. Rilliet and Barthez have called attention to such cases in the clinical history of tuberculosis. The following case may be cited as an example; it occurred in the infant's service of Charity Hospital, in this city, in April, 1866.

An infant, about one year old, affected with tuberculosis, both bronchial and pulmonary, was observed, during the ten days preceding its death, to bore the pillow with its head almost constantly, so as to wear the hair from the occiput. This movement of the head was the only prominent cerebral symptom. Nothing abnormal was noticed in the appearance of the eyes, nor was the stomach irritable. A spasmodic cough and progressive emaciation attracted attention, but these were referable to the tubercular disease. At the autopsy, we found the cerebral sinuses, veins, and capillaries greatly congested. On tracing the veins which return blood from the brain, an inflamed and enlarged bronchial gland was discovered in the angle formed by the convergence of the right and left venæ innominatæ. This gland, which contained but a single point of tubercular exudation, had attained such a volume by proliferation of its cells, that it pressed upon both vessels, so that it had obviously retarded the circulation in each, and given rise to the cerebral congestion.

Passive congestion often occurs in the infant at birth, either from tediousness of the labor, or delay in the expulsion of the body after the birth of the head. If it is simple congestion, and not congestion with hemorrhage, it soon passes off. Passive congestion of the brain also occurs in severe paroxysms of hooping-cough, in which return of blood from this organ is temporarily retarded. All are familiar with the congestion which occurs in parts external to the cranium, from the severity of the cough; producing epistaxis, extravasations under the conjunctiva, etc. The extra-cranial obviously indicates the presence and degree of cerebral congestion.

Those who practise in malarious regions sometimes meet cases of dangerous passive congestion of the brain, the result of malaria, occurring especially in the cold stage of intermittent fever. In these cases, the surface is pallid, its temperature reduced, and the pulse feeble. The blood, leaving the peripheral vessels, collects in undue quantity in the internal organs, producing congestion of the brain, as well as of the thoracic and abdominal viscera. In the child with malarious disease, in whom there is less vigor of constitution than in the adult, death not infrequently occurs in this passive congestion. Two such cases have occurred in my practice, although in this latitude the malarious affections are mild in comparison with the type which they present in many parts of the United States.

SYMPTOMS.—The symptoms of ACTIVE congestion of the brain are stupor, great heat of head, throbbing of carotids, restlessness when aroused, twitching of the limbs, and perhaps convulsions. There is also sometimes intolerance of light, and the anterior fontanelle, if open, pulsates strongly. In PASSIVE congestion many of the symptoms are the same as in the active form. Stupor, twitching of the limbs, and fretfulness or irritability when the patient is disturbed, are common, ordinarily without increase of temperature; the surface may, indeed, be cool, and the face is not flushed nor the eyes injected. The strong pulsation and elevation of the anterior fontanelle, so conspicuous in active congestion, are—the former always, the latter often—lacking. In both forms there is a tendency to constipation.

In many cases the symptoms of congestion of the brain are associated with others which proceed directly from the cause of the congestion, but it is not difficult, unless in exceptional instances, to determine which are due to the congestion, and which to the antecedent and coexisting pathological state.

ANATOMICAL CHARACTERS.—In active congestion there is an excess of arterial blood in the brain and its membranes. The arteries, to their minutest branches, are seen to be full, presenting the bright hue of oxygenated blood. In passive congestion the sinuses and veins are distended. The pia mater, choroid plexus, and the vessels of the brain, have a darker appearance than in active congestion. In both forms of congestion, if they continue for a little time, other anatomical changes occur. If there is great distension of the capillaries, these vessels are apt to give way, and we find here and there little patches of extravasated blood. In other cases the over-distension is relieved by the transudation of the serous portion of the blood through the coats of the vessels. The cephalo-rachidian fluid is then found in excess external to the brain and in the ventricles.

PROGNOSIS.—The duration and the result of congestion of the brain depend, in great measure, on the nature of the cause. If the cause is trivial, as mental excitement, fatigue, exposure to heat, there is usually prompt relief if the condition of the patient is understood and properly treated. If the cause is general or constitutional, as one of the essential fevers or hooping-cough, or if it is local, but its seat external to the cranium, the prognosis, so far as the congestion is concerned, is not unfavorable, if there is a timely and judicious use of remedies. The most unfavorable cases are those in which the cause is seated in the encephalon, and those in which there is some obstructive disease in the course of the circulation. Congestion occurring from a structural change within the cranium is, from the nature of the cause, without remedy, and ordinarily fatal. Obstructive diseases of the circulatory system, wherever located, being for the most part permanent, give rise, as a rule, to incurable congestion.

Congestion of the brain, if it is not relieved in a few hours, becomes less and less amenable to treatment. It soon passes beyond the resources of our art, and ends in coma; it is seldom protracted beyond a few days. Extravasations of blood common in active congestion, and serous effusion common in the passive form, diminish the chances of a favorable result.

TREATMENT.—The indication for treatment in active congestion is plain. Measures should be employed which have a derivative effect from the brain. Unless there is an asthenic primary affection, in the course of which the congestion is developed, active purgation is required. A saline purgative is ordinarily preferable. If the stomach is irritable, there is no better purgative than calomel. In all cases of active congestion, whatever the cause, the bowels should be kept open. It is often better not to wait for the tardy action of a cathartic, but to give at once an enema of soap and water or salt and water. External derivative agents are also indicated. A warm mustard foot-bath, sinapisms to the back of the neck or chest, and to the feet, and cold applications to the head, are measures which should never be neglected.

This treatment, if employed early, will relieve the congestion in a large proportion of cases; but if there is no improvement, if the child is robust, and if the primary affection be such as does not contraindicate loss of blood, leeches should be applied to the temples or some part of the head. If after the lapse of some hours cerebral symptoms continue, apoplexy or serous effusion has probably occurred. Congestion is then no longer the prominent lesion, and it is proper to designate the disease by another name.

The treatment appropriate to passive congestion is somewhat different; cold applications to the head, and those of a derivative nature to the extremities, are useful. As this form of the disease is not primary, but is dependent on some antecedent pathological state, it is evident that it can only be treated successfully by removing or obviating as far as possible the cause. But the nature of the various obstructions to the intra-cranial circulation is such that our ability to accomplish this end is very limited.

If the cause is constitutional, or if it be some disease in the neck or chest, it may sometimes be partially or even wholly removed, but if seated within the cranium it is beyond our control. In general, it may be said that depletion is not required or tolerated in passive congestion, and occasionally stimulants are needed.

CHAPTER VI.

INTRA-CRANIAL HEMORRHAGE (MENINGEAL HEMORRHAGE—CEREBRAL HEMORRHAGE).

Hemorrhage within the cranium is not very infrequent in infancy and childhood; and there is no part of the encephalon, whether the meninges or brain, in which it does not sometimes occur. If the blood is extravasated upon the surface of the brain or between the meninges, the disease is designated by writers meningeal apoplexy; if in the substance of the brain, cerebral apoplexy. Extravasation may also occur in one of the lateral ventricles. This may, for convenience, be described as a form of meningeal apoplexy.

Causes.—Apoplexy is usually (there is an exception) preceded by congestion. If the congestion increases to a certain degree, the distended capillaries give way, and extravasation of blood results. Therefore the causes of congestion which have been enumerated in the preceding article are, in great measure, those of apoplexy. Recent microscopic examinations have demonstrated that the corpuscular elements of the blood may escape from capillaries without rupture. While, therefore, it is probable that intra-cranial hemorrhage in early life commonly occurs from a rupture, its occasional occurrence through the walls of the capillaries must be admitted.

Intra-cranial hemorrhage is not infrequent in the new-born. It results in them from tediousness of the birth, and severity of the labor-pains. At first there is extreme congestion of the meningeal and cerebral vessels corresponding with that of the scalp and face. This congestion continuing, soon ends in extravasation of blood. In some of these cases forceps have been used to effect the delivery, but it is doubtful whether the use of instruments materially increases the congestion or the amount of extravasation. Certainly in a large proportion of intra-cranial as well as supra-cranial hemorrhage of the new-born, instruments have not been used. An additional cause of the hemorrhage is in some instances the use of ergot, which, by producing strong and continuous pains, interrupts the placental circulation and increases the congestion of the fœtal veins and capillaries.

In infants a few days old, intra-cranial hemorrhage may result from that rapid and fatal disease, tetanus neonatorum. The hemorrhage is preceded by intense passive congestion, which the tetanic rigidity and spasms produce by obstructing respiration and circulation. Few cases of tetanus neonatorum occur without more or less extravasation of blood, either meningeal or cerebral. Another cause of this disease is obstruction in the vessels which return the blood from the brain. The various structural changes which produce this obstruction, in different cases, have been sufficiently described in our remarks on cerebral congestion and thrombosis.

The congestion which precedes hemorrhage, when occurring under the conditions described above, is passive.

Among the causes which produce hemorrhage through the intermediate state of active congestion, may be mentioned great mental excitement, of which M. Legendre relates a case, lengthened exposure to the sun's rays, an example of which Rilliet and Barthez have seen. It is also said that compression of the aorta by an enlarged liver or an abdominal tumor has sometimes produced meningeal or cerebral hæmorrhage by causing an increased afflux of blood to the head. A very important cause to which I have not alluded, is that general state of the circulatory system which is designated by the term purpura hæmorrhagica. This sometimes results from the anti-hygienic conditions in which the child is placed. In other instances it results from some antecedent disease, protracted, debilitating, and which has produced a profound alteration in the state of the blood and the vessels. The capillaries become less firm and elastic, and easily give way, so that in such patients ecchymotic points are ordinarily found in different parts of the system. The diseases which occasionally end in this hemorrhagic diathesis are numerous. I have known it to occur after measles, scarlet fever, and smallpox. It is also an occasional sequel of chronic diarrhœa, of intermittent and typhoid fevers, and of rachitis.

ANATOMICAL CHARACTERS.—Hemorrhage in or upon the brain in infancy and childhood, differs in important particulars from that occurring in adult life. In the adult, and more so as life advances, the arteries become less distensible and more brittle, so that when hemorrhage occurs it is usually from one of these vessels. In early life, on the other hand, the blood does not ordinarily escape from an artery, but, as has been stated, from the capillaries. The extravasation is not, therefore, so rapid and violent, and is not attended with such laceration and injury of surrounding parts, in infancy and childhood, as at a subsequent age. In the adult, the hemorrhage commonly occurs in the substance of the brain. The flow of blood from the ruptured artery separates the brain-substance, producing a cavity in which a clot forms. This constitutes the usual form of apoplexy in the adult. In the first years of life, on the contrary, the extravasation is commonly from the meninges, and the symptoms to which the effused fluid gives rise are mainly referable to its mechanical effect. Cases of hemorrhage in the substance of the brain constitute a small minority, unless during the days immediately succeeding birth. In early life, therefore, on account of its greater frequency, meningeal hemorrhage is a disease of more importance than cerebral, and its anatomical character should be carefully studied.

In *meningeal hemorrhage* the extravasation may be between the cranium and dura mater, upon the visceral layer of the arachnoid, in the meshes of the pia mater, or in a lateral ventricle, from rupture of the capillaries in the choroid plexus. Much the most common seat is external to the pia mater in the so-called cavity of the arachnoid; the blood escaping in this situation spreads uniformly in all directions. It soon separates in two portions, the solid and liquid. The solid portion, or the clot, is free or but slightly attached to the adjacent membrane. The meninges in the vicinity of the extravasated blood preserve their normal appearance, or are but slightly injected; the clot gradually becomes extended on all sides, so as to form a lamina at the seat of the extravasation, thinner at its circumference than centre, and at first of a dark red color. The color gradually fades, and the lamina becoming smooth and polished, and at the same time more and more attenuated, finally resembles the arachnoid in appearance. Its diameter varies in different cases from a few lines to two or three or more inches. M. Tonnelé relates two observations in which the adventitious membrane extended over the superior surface of both hemispheres, and in one of them, also, over the falx cerebri.

The extravasation may occur at any part of the surface of the brain, but its usual seat is the vertex. The next most frequent locality is the base of the brain. The subsequent history of the delicate membrane into which the clot is gradually transformed is interesting. It often extends so as to cover more space than was occupied by the extravasated blood, and its edges are then scarcely distinguishable, in consequence of their extreme tenuity, and their close resemblance to the arachnoid. The attachments ot this membrane, so far as it forms any, are usually to the parietal surface of the arachnoid. Sometimes a portion of the membrane is attached, while the rest lies free, bathed on either side by the liquid portion of the blood which still remains from the extravasation. According to M. Legendre, in the most favorable cases, the serum is absorbed, and the membrane which has resulted from the clot, and which I have described, becomes intimately adherent to the internal surface of the dura mater. It forms an integral part of this membrane, and there only remain a little thickening and increased opacity, indicating the seat of the extravasation. The health is fully re-established.

But the result in other cases is as follows. The serum is not absorbed, and the newly-formed membrane, uniting at points with the inner surface of the dura mater, or its arachnoidal covering, incloses the fluid so as to produce a circumscribed hydrocephalus.

Sometimes there is only one cyst; in other instances the membrane, especially if large, unites in such a way as to give rise to more cysts than one. The size of the cyst varies, according to the quantity of fluid, which may be only a few drachms or several ounces. Rilliet and Barthez report a case in which there was a pint of fluid lying over each hemisphere, there being two cysts. If the cranial bones are not united, so that they yield to the pressure, the size of the cranium is increased, and if the extravasation is confined to one side, an inequality results, and the symmetry of the head is destroyed. The fluid which causes the enlargement of the head in such cases, is in part the serum of the extravasated blood, and in part a subsequent secretion.

Various writers relate cases of ventricular hemorrhage. Valleix met it in an infant that died at the age of two days. In the *Edin. Journ. of Med. and Surg.*, October, 1831, an interesting case is related. A boy, nine years old, died of hemorrhage in both ventricles, and also at the base of the brain and in the spinal canal. In the Nursery and Child's Hospital of this city, the post-mortem examination was made of an infant who died at the age of one month. In the posterior cornu of the left lateral ventricle were two clots, elongated and black, one larger than the other. In the corresponding cornu, on the opposite side, was a smaller clot. A similar post-mortem appearance was observed at the autopsy of a young infant in the infant service of Charity Hospital. A dark crescentic clot lay in each posterior cornu. The clot, if remaining a long time, undergoes degeneration. In one case of an adult, in which a year had elapsed after the extravasation, I found it to contain crystals of cholesterine and carbonate of lime.

CEREBRAL HEMORRHAGE, or hemorrhage in the substance of the brain, may occur at any time in infancy and childhood. The blood is sometimes extravasated in points, here and there, over the entire organ, or a part of the organ; in other cases it is extravasated in one or perhaps two cavities, as in the ordinary form of apoplexy in the adult. In the first form of cerebral hemorrhage, or that in which the blood escapes from numerous points through the brain, there is evidently little laceration or injury of the organ. The brain-substance surrounding the hemorrhagic points sometimes preserves the usual appearance. It is white and firm. In other cases it presents a reddish or yellowish appearance, and is softened to the depth of a line or two. If the hemorrhage occur in a cavity, as in apoplexy of adults, the nerve-fibres are evidently torn and separated, and there is more or less compression of the surrounding brain-substance. Unless the disease is of long standing, the cavity contains a dark and soft clot bathed with serum, which has a reddish or a yellowish-red appearance. The brain in the immediate vicinity of the cavity is sometimes softened. Rilliet and Barthez state that they have seen eight cases of cerebral hemorrhage of the capillary form; ten cases in which the hemorrhage was in cavities; and in two of the eighteen both forms were present. In five of those in which the form was capillary the disease was limited to portions of the brain, while in the remaining three the hemorrhagic points were found in nearly every part of the brain.

Apoplectic cavities are seldom seen in the cerebellum, and, whether the hemorrhage be capillary or in a cavity, there is, in most cases, as previously stated, more or less congestion of the vessels of the brain.

The proportion of cases of cerebral to other forms of hemorrhage is believed by some to be greater in the new-born than at any other period of life. Valleix relates four cases of intra-cranial hemorrhage occurring at this age, two of which were cerebral, one ventricular, and in the other the extravasation was in the cavity of the arachnoid. Mignot has published eight cases occurring in the new-born, in two of which the hemorrhage was in cavities in the cerebrum; in three, in the lateral ventricles; and in three, external to the brain. If the same proportion be observed in other statistics, one in three of the cases of intra-cranial hemorrhage occurring in the new-born is cerebral.

SYMPTOMS.—The symptoms in intra-cranial hemorrhage are not uniform; they vary according to the seat as well as the quantity of the effused blood. In some cases the extravasation occurs without such symptoms as would direct attention to the brain. When the hemorrhage occurs at the time of birth, in consequence of the strong and long-continued labor-pains, the infant is often born apparently dead. This is due partly to the hemorrhage, partly to the great congestion of the brain which precedes and accompanies the hemorrhage. Resuscitation is gradual and difficult. The infant's features are livid and perhaps swollen, its respiration is gasping, and both pulse and respiration are slow. Its cry is feeble, with but slight movement of the facial muscles, and the lungs are but partially inflated; the eyelids are closed, and the limbs almost motionless. By artificial respiration and by friction, the pulse and breathing may be rendered more frequent, but the latter remains irregular and gasping. Finally, the limbs grow cold, the surface, from a state of lividity, becomes pallid, and death occurs in profound coma. M. Cruveilhier made many observations at the "Maternity" in reference to the death of new-born infants, and he believes that one-third of those who die in birth, at the full period, die of apoplexy. I have made post-mortem examinations in a few cases, when death had occurred from this cause, and in all the hemorrhage was meningeal. One of these was born on the 30th of December, 1864. The birth was delayed by unusual projection of the promontory of the sacrum, so that finally the application of forceps was necessary. The infant was apparently stillborn, but by persistent efforts on the part of the physician who assisted, it was resuscitated so as to live several hours, though with constant embarrassment of respiration and with lividity. At the autopsy a large extravasation of blood was found in the cavity of the arachnoid, over a considerable part of the convexity of the brain, and the substance of the brain was deeply congested.

Apoplexy in the new-born does not always terminate fatally, or, when fatal, in the sudden manner which I have described. Valleix relates the case of an infant who died of pneumonia at the age of three and a half months. Its birth had been protracted cult, but was completed without the use of instruments. It had had during its entire life paralysis of the right side. At the autopsy a clot was found near the base of the right thalamus opticus, evidently existing from birth. Around the clot the brain was softened to the depth of some lines, and was of a bluish-red color. A very similar case is related by M. Vernois. An infant lived forty-nine days with paralysis of the left side, and died of pneumonia. At the autopsy a hemorrhagic excavation in the process of cicatrization was found behind the right corpus striatum and the thalamus opticus.

Intra-cranial hemorrhage occurring from accidents of birth is generally attended by marked symptoms, such as have been described. But when it occurs subsequently to birth, whether in infancy or childhood, the symptoms vary greatly in different cases, and are generally obscure. I will briefly state the symptoms which have been observed in both the cerebral and meningeal forms of this disease. First, the cerebral. Sédillot relates the case of a child seven and a half years old, whose bare head had been exposed several hours to the sun's rays. Suddenly, after a paroxysm of anger, it was seized with great pain, corresponding with the posterior and inferior fossæ of the cranium. It uttered piercing cries, and died in a quarter of an hour. A clot was found in the right lobe of the cerebellum. Richard Quinn (Rilliet and Barthez) gives the history of a boy nine years old, who in playing with a hoop suddenly stopped, carried his hands to his head, and fell backwards unconscious. Three or four hours afterwards, when examined, he was found pale, surface cool, respiration slow and at times stertorous, pulse 50 to 60 per minute; the left arm was flexed; the left leg paralyzed; the right leg and arm convulsed; right pupil strongly dilated, the left contracted. He died seven hours after the commencement of the attack, and a large clot was found in the centrum ovale on the right side.

Rilliet and Barthez relate the following case from Campbell. A boy with good previous health was suddenly seized about 7 A.M. with repeated vomiting, and in an hour and a half with violent convulsions; he rolled his eyes and uttered inarticulate cries; pulse frequent and hard; pupils contracted; trunk and lower extremities cool. In the afternoon he presented symptoms of compression of the brain, such as dilatation of the pupils, frequent and feeble pulse. Death occurred in the evening, and a hemorrhagic cavity was found occupying the right middle lobe of the cerebrum. Guibert relates a case of extravasation in the superior part of the right hemisphere of the brain in a boy fourteen years old. The principal symptoms were feebleness of the limbs, inability to walk, cephalalgia, involuntary evacuations, fever, grinding the teeth, rigors severe and prolonged, lividity, loss of intellectual faculties, dilatation of the pupils, insensibility to light, stertorous respiration. Death occurred in about an hour.

Rilliet and Barthez narrate the history of a girl two years old, who, after an attack of measles, was taken with convulsions accompanied with fever and prostration. The convulsive movements affected especially the eyes and upper extremities; the right leg was immovable; the left pupil dilated. These symptoms resulted from hemorrhage in the corpus striatum and opticus thalamus. The same authors relate also the case of a girl, seven years old, who died with a large apoplectic cavity in the left thalamus opticus. The symptoms were headache, convulsive movements, loss of consciousness, delirium, vomiting and constipation, convergent strabismus. These symptoms nearly disappeared, but in a few days the headache returned, with strabismus and a slight drawing of the face towards the left; on the twenty-seventh day there were some convulsive movements of the right eye, with paralysis of the arm. Finally contraction of the arms occurred, with acceleration of pulse, irregular breathing, dilated pupils, paralysis, and retraction of the head, followed by death on the forty-eighth day.

These cases, and those from Valleix and Vernois, which have been related in our remarks on hemorrhage of the new-born, are sufficient to show the character of the symptoms in that form of cerebral hemorrhage in which the extravasated blood forms a cavity in the interior of the brain.

If the amount of extravasation is large, and the substance of the brain is much lacerated and compressed, death may occur almost immediately, and, therefore, without symptoms, or before it is possible to determine whether or not symptoms are present. If the disease is not so speedily fatal, the symptoms, as appears from the above cases, are headache, confusion of thought, or even insensibility, cries, sometimes piercing, cold extremities, pallor, slow and perhaps stertorous respiration, convulsive movements followed by paralysis, or convulsions affecting one or more limbs, with paralysis of others, pupils contracted or dilated, sometimes one contracted and the other dilated, strabismus, rolling of eyes, vomiting.

These symptoms have all been observed in different cases, but they are not all present in any one case. Those which are generally present, and on which we mainly rely for diagnosis, are headache, convulsive movements, paralysis, confusion of thought, irregularity in the pupils, and strabismus.

In the CAPILLARY form of cerebral hemorrhage there is usually some complication, so that it is not easy to determine how far symptoms are due to the hemorrhage, and how far to the coexisting pathological state.

There are, indeed, but few published observations of capillary hemorrhage in the substance of the brain uncomplicated with meningeal hemorrhage, hemorrhage in a cavity, or some other and distinct disease, but so far as I have been able to ascertain the symptoms referable to this form of extravasation, they are as follows: The child is drowsy; fretful when disturbed; it perhaps moans. There are sometimes slight convulsive movements and partial paralysis. If there is considerable extravasation, the respiration is irregular and sighing. Death occurs in coma, occasionally preceded by convulsions. Taupin relates the case of a child nine years old, who died with this form of hemorrhage, accompanied by softening of the brain. The disease began at night, with delirium, agitation, and piercing cries. In the morning, the patient lay in bed, drowsy, not complaining of pain, and not replying to questions; pupils dilated, and insensible to light; left eye half open during sleep, and its axis changed; eyebrows contracted; face pale; mouth open; had no convulsions, but transient stiffening of the limbs, during which the thumbs were firmly compressed by the fingers; senses unimpaired, but the face drawn to the right; deglutition difficult; pulse small, irregular, and feeble; respiration 32, sighing. In the evening he had rigidity of the limbs and back, and, finally, was taken with general convulsions, in which he died at eleven o'clock. The hemorrhagic points in this case were numerous. A boy five years old, whose case is described by Rilliet and Barthez, died of this disease, pneumonia, and white softening of the intestine. During the last five days there were cerebral symptoms, the chief of which were drowsiness, fretfulness when disturbed, and moaning without apparent cause. Another child, whose case is described by Rilliet and Barthez, died at the age of four years, with cerebral capillary hemorrhage, accompanied by yellow softening. Six months before death he had general convulsions, followed by spasmodic movements of the left side. These subsided, but the left side remained feeble.

In MENINGEAL HEMORRHAGE there are often convulsions, general or partial, in some patients tonic, in others clonic. When partial, the convulsive movements may only occur in the muscles of the face and eyes. With the spasmodic muscular action is a degree of drowsiness and irritability. Paralysis, so common in the apoplexy of the adult, and not infrequent, as we have seen, in the cerebral form of early life, is sometimes, but not ordinarily, present in meningeal hemorrhage. Instead of paralysis, there are vomiting, some febrile action, thirst, and loss of appetite. The symptoms are different, however, according to the exact seat of the hemorrhagic extravasations, and the duration of the disease. If the extravasation end in the formation of a cyst, the symptoms are those of hydrocephalus. The following condensed history of cases which I have selected as typical, will give us a clearer idea of the history and course of the various forms of meningeal hemorrhage than can be imparted by a narration of symptoms:—

M. Tonnelé relates the case of a child who was taken with faintness and convulsive movements. On the following day the trunk and inferior extremities became rigid; deglutition was painful; the pupils were largely dilated, immovable; face pale; pulse feeble and intermittent. Death occurred the same day. The dura mater was distended. A layer of coagulated blood, of great thickness, extended over the convexity of each hemisphere. The veins ramifying in the superior part of each hemisphere were distended with coagulated blood. The hemorrhage was in the meshes of the pia mater. Drs. Lombard and Panchard, of Geneva, relate a somewhat similar case. A child thirteen months old was convalescing from inflammation of the bronchial and intestinal mucous surfaces, when it was seized with general convulsions; the mouth and eyes were open, and the eyes directed upwards; pupils contracted; pulse frequent and irregular. The convulsions abated somewhat, but soon reappeared with violence. The patient became insensible, and died nineteen hours after the commencement of cerebral symptoms. The extravasated blood covered the upper surface of both hemispheres. From the above cases we see the symptoms and the course of meningeal hemorrhage, when the extravasation is so large that death speedily results. In protracted cases of meningeal hemorrhage, there is either a gradual disappearance of symptoms and return to health, or, circumscribed hydrocephalus occurring, the symptoms of that disease arise.

DIAGNOSIS.—It is evident from what has been stated that the diagnosis of intra-cranial hemorrhage is attended with unusual difficulty, since the symptoms of this disease occur also in other and distinct pathological states. The history of the case, and especially the character of the cause, if ascertained, will aid in diagnosis. If there has been an obvious determination of blood to the brain, or some known obstruction to the return of blood from that organ, the persistence of cerebral symptoms would justify us in concluding that either serous or sanguineous effusion had supervened on a state of congestion. The points of differential diagnosis between apoplexy and meningitis are the sudden and full development of symptoms in one case, the gradual commencement and gradual increase of symptoms in the other; differences also of symptoms in certain respects; for example, as regards febrile reaction, constipation, etc.

There is one symptom in cerebral hemorrhage which is of great diagnostic value, namely, paralysis. Its progress affords strong evidence that there is extravasation of blood, and probably in a cavity in the substance of the brain. If the extravasation end in the formation of a cyst, the symptoms and appearances of hydrocephalus, which, after a time, arise, throw light on the nature of the disease.

Prognosis.—There can be no doubt that many cases of intra-cranial hemorrhage occur and terminate favorably without the nature of the disease being suspected. In such cases the amount of extravasated blood is small or moderate. In several published cases in which the accuracy of the diagnosis was shown by post-mortem examinations, the patients were convalescing from the hemorrhage when they succumbed to intercurrent diseases. If, however, the amount of extravasated blood is such as to give rise to those symptoms which have been described, the prognosis is unfavorable. Recurring convulsions, and persistent stupor from which it is difficult to arouse the patient, are unfavorable symptoms. If the convulsions cease, and consciousness returns, even if there is paralysis, the result may be favorable.

Treatment.—The proper treatment in intra-cranial hemorrhage depends on the state of the patient, the time which has elapsed since the extravasation, and the degree of it, as shown by the nature and severity of the symptoms. If, as is often the case, the patient is robust, and is visited soon after the commencement of the attack, cold applications should be made to the head, mustard to the back of the neck and perhaps chest, and derivation should be produced by mustard pediluvia. In many cases, especially in active congestion, it is advisable to apply leeches to the temples, and the bowels should be opened by a stimulating enema. In active congestion, also, prompt purgation by salines or other cathartics is sometimes of great importance. The object of such treatment is to relieve congestion of the cerebral and meningeal vessels, and thereby prevent further extravasation of blood. If the congestion be active, the pulse continue full and frequent, and the face be flushed, it is proper in many cases to control the action of the heart by a sedative. For this purpose the tincture of veratrum viride may be given in doses of one drop to a child five years old, repeated in three hours if necessary, or aconite may be employed. If the stupor or convulsions continue after sufficient time has elapsed for the patient to receive the full benefit of the above remedies, more active counter-irritation is required. Cantharidal collodion should be applied behind each ear. If the hemorrhage occur from passive congestion, or in a cachectic state of system, active depressing remedies should not be employed. External derivatives are of service, as well as cool applications to the head, and we should attempt, so far as possible, to remove the cause of the congestion and hemorrhage. If it depend on a cachectic state, tonic or other remedies calculated to relieve this state are indicated. The hemorrhage from such a cause is apt to be in points in the substance of the brain, or in moderate quantity over the surface of this organ, and by a timely use of constitutional remedies possibly we may prevent further extravasation of blood and increase the chance of the patient's recovery.

If a cyst result from the hemorrhagic effusion, the treatment which is proper is that described in the chapter on Acquired Hydrocephalus.

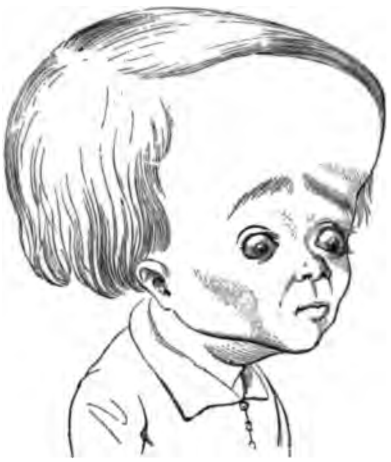
CHAPTER VII.

CONGENITAL HYDROCEPHALUS.

Congenital hydrocephalus consists in an excess of the cerebro-spinal fluid, lying either external to the brain, or more frequently in its interior. It is due to some vice in the development of the brain or its membranes, or to a pathological state occurring in them during intra-uterine life. This disease is ordinarily apparent from the symptoms and appearances at birth, but not always. Occasionally nothing unusual is observed in the shape of the head or aspect—

of the infant till after the lapse of some weeks, when the characteristic physiognomy begins to appear. In these cases the disease is still congenital, as there is every reason to believe that the abnormal state to which the excessive production of fluid is due existed from birth. In cases of arrested or partial development of the brain, as, for example, when a considerable portion of the hemispheres is absent, there is often an unusually large quantity of fluid which serves merely as a compensation for the lack of brain. I do not regard such cases as examples of hydrocephalic disease, since the effect of the fluid is not injurious, but rather useful. I restrict the term congenital hydrocephalus to those cases in which the brain is complete, or, if incomplete, the quantity of fluid is more than sufficient to supply the deficiency.

Anatomical Characters.—According to M. Breschet, the fluid in congenital hydrocephalus may be—1st, between the dura mater and the cranium; 2d, between the dura mater and the parietal arachnoid; 3d, in the cavity of the arachnoid; 4th, in the ventricles; 5th, between the arachnoid and the brain.



Congenital hydrocephalus. (From Gross.)

In a large majority of hydrocephalic patients the seat of the effusion is the ventricles. As the quantity of fluid increases, the pressure from within gradually unfolds the convolutions of the brain, at the same time producing expansion of the cranial arch. When the amount of fluid is considerable, and it becomes so in the course of a few weeks or months, the hemispheres are spread out in a thin lamina on either side, gradually decreasing in thickness from the base of the cranium to the vertex, where the brain-substance is sometimes so thin as to be scarcely perceptible. Complete absence of brain in this situation, namely, at the vertex, even in extreme cases of expansion and flattening of the hemispheres from the pressure of the liquid is rare, though the brain-substance at this point is sometimes almost as thin as either of the membranes, so that the wall of the sac is translucent. The membranes which surround the brain do not usually undergo any alteration, except such as arises from the distension. The falx cerebri sometimes disappears, and sometimes the meninges present a whiter hue from maceration than in health. The distension also causes such an expansion of the pia mater that it becomes very thin, and in places scarcely visible, but its presence in every point can be demonstrated.

The changes which the cranial bones undergo, both in their chemical character and in their shape, in hydrocephalic patients, if the amount of fluid is considerable, are interesting and remarkable. The base of the cranium undergoes little change, but those portions of the frontal, parietal, and occipital bones which constitute the arch are expanded in all directions, while they become much thinner. There is deficiency of lime in their constitution, so that their organic elements are greatly in excess. This renders them flexible and semi-transparent. Notwithstanding the expansion of the bones, there are usually interspaces between them, of greater or less size, according to the amount of fluid.

The scalp, being stretched by the pressure within, becomes tense and thin, and is scantily covered with hair. The veins which ramify in it are unusually prominent and large, and the head is elastic on pressure, from the amount of liquid beneath. In the common form of congenital hydrocephalus, namely, that in which the liquid is in the interior of the brain, the shape of the orbital plates of the frontal bone is changed, so that the eyeballs have a downward direction. This change in the axis of the eyes occurs at an early period, and it continues through the entire disease, becoming more and more marked as the quantity of liquid increases. If the amount be large, the lower part of the cornea is buried under the under eyelid, while the conjunctiva is visible between the cornea and the upper eyelid. The persistent downward direction of the eyes is characteristic of this disease, and, in connection with enlargement of the head, is an important diagnostic sign.

If we examine the interior of the cavity after the fluid is evacuated, we will find at its base the parts which lie in the floor of the lateral ventricles, but changed in appearance in consequence of pressure. The cornua are enlarged, and the thalami optici and corpora striata are flattened. I [illegible] early stages of the disease, when the amount of fluid is [illegible] ere is probably no absorption or destruction of parts in [illegible] rious portions of this organ r [illegible] other. As the quant [illegible] which unites the lateral ventricles, becomes enlarged, the septum lucidum which separates them disappears, and the two ventricles form a common cavity. In most fatal cases we find this single large cavity. The surface which surrounds the cavity occasionally presents a whitish or semi-opaque appearance, which has led to the belief, on the part of some, that at a period antecedent to birth there was subacute inflammation of this surface, and hence the effusion.

The bones of the face are ordinarily less developed than in healthy children of the same age, so that the disproportion between the head and face becomes a marked peculiarity. The shape of the forehead and face is nearly triangular.

The foregoing remarks in reference to the anatomical characters of congenital hydrocephalus refer in the main to cases which have continued for a considerable time, so that their characteristic features are well marked. In very young infants, in whom the disease is still recent, similar anatomical characters are present, but in less degree.

Congenital hydrocephalus is often associated with other vices of conformation, especially with spina bifida. The two, when coexisting, are only parts of the same disease; the large quantity of cerebro-spinal fluid preventing the spinal canal from closing during fœtal development.

The fluid in congenital hydrocephalus consists largely of water, in the proportion even of 99 parts in 100. In addition to this element, there are traces of albumen, chloride of sodium, phosphate and carbonate of soda, and osmazome.

I have had an opportunity to witness only one post-mortem examination in a case of congenital hydrocephalus in which the liquid was exterior to the brain. This case was under observation in the children's service of Charity Hospital, in 1866. Full notes and measurements of the head were taken, which unfortunately were mislaid or lost. The infant had congenital syphilis, and had a pallid, strumous appearance. The shape and relative size of the head are seen in the accompanying figure, from a photograph. While the whole head was enlarged, there was a relative excess of development in the part between and above the ears. The axis of the eyes was not at all changed, and the vision was good. The appearance corresponded so closely with descriptions of hypertrophy of the brain, that this was supposed to be the anatomical state. Antisyphilitic treatment was employed, and the

syphilitic eruptions had nearly disappeared, when diarrhœa supervened, followed by death. At the autopsy, a quantity of transparent or light straw-colored liquid, estimated at six or seven ounces, was found exterior to the brain, in the great cavity of the arachnoid, lying mostly over the superior surface of the organ. There was no excess of liquid in the ventricles, and the brain, though of good size, was not abnormally large, nor did it possess the firmness which is present in true hypertrophy.

All cases of congenital hydrocephalus may be embraced in two groups, namely, that in which the liquid is in the interior of the brain, and that in which it lies exterior to the organ. Liquid primarily in the arachnoidean cavity permeates the meshes of the pia mater, and lies in part underneath it, or this delicate membrane may be ruptured. Four of the groups, therefore, described by Breschet, may properly be reduced to one, namely, those groups in which the liquid lies under, between, or external to the meninges. It is probable that some of the cases which led to Breschet's classification were examples of acquired circumscribed hydrocephalus, the result of extravasation of blood. In this form of hydrocephalus, as is stated elsewhere, an adventitious membrane forms external to the liquid, becoming in time thin and delicate, and often bearing a close resemblance to the normal membrane (especially the arachnoid), for which it is sometimes mistaken.

Symptoms.—If there is a considerable amount of hydrocephalic fluid prior to the birth of the child, so that the head is abnormally large, parturition is seriously interfered with. The scalp and meninges may become ruptured by the severity of the pains so that the fluid escapes. If this does not occur, the labor is often necessarily instrumental. Whether the liquid is present before birth or accumulates subsequently to it, the tendency is to an increase of the quantity, and a corresponding enlargement of the head.

The digestive function in this disease is at first well performed. The infant nurses readily, and has its evacuations with the regularity of other children. Not many weeks, however, elapse, in the majority of cases, before defective nutrition is apparent.

While the volume of the head increases, other parts are imperfectly nourished and stunted in their growth. Emaciation is common of the neck, trunk, and limbs, associated with progressive feebleness. In the last stages of this disease there is more or less vomiting, with constipation. If there was previously the ability to support the head, it is now lost, and the erect position is no longer possible. In marked cases, when there is great disproportion between the head and the rest of the system, there is frequently not even the ability to rotate the head on the pillow. As long as the cranial bones yield readily to the pressure from within, and there is no compression of the brain, the function of this organ is not seriously impaired. The child recognizes its mother or nurse, and it can be amused like other children, though easily fatigued. The state of the senses is different in different cases, and sometimes at different stages of the same case. The sight and hearing in some are perfect, in others impaired; while in others still they are good at first, but gradually become obscured and lost. It is said that the sense of smell may be perverted so that agreeable odors are unpleasant, and *vice versâ*. Many, reaching the age at which children begin to walk, cannot walk, or if they do, it is with a tottering, unsteady gait.

When the liquid increases to that extent, and it usually does sooner or later, that the brain begins to be compressed, dangerous cerebral symptoms arise. The child becomes drowsy, and takes less notice of objects. There are twitching of the limbs and finally convulsions. The pupils act feebly or irregularly by light, or one is more dilated than the other. Strabismus also occurs. As a fatal termination approaches, convulsions occur, partial or general. These are soon succeeded by the last stage, that of coma, in which the patient expires.

The following case, which I copy from my note-book, is an example of the common form of congenital hydrocephalus. It will give an idea of the ordinary course of this disease, and show the difficulty which we meet with in its treatment. Female, born Nov. 9, 1859, with the aid of forceps. At birth the fontanelles were unusually large, the cranial bones separated, and the aspect in a marked degree hydrocephalic. She nursed at first, but, the mother's milk failing, she was afterwards bottle-fed. At the age of four months her head, which had increased faster than her general growth, measured from one auditory meatus to the other, over the vertex, seventeen inches; the occipito-frontal circumference, twenty-three inches. At this time she manifested considerable intelligence, being able to distinguish her mother from other persons, though the head was so large that it was necessary to support it constantly on a pillow. From the age of four to six months the operation of tapping was performed six times with a small hydrocele trocar, by Prof. Stephen Smith, at a point near the coronal suture and from an inch to an inch and a half from the sagittal. At each operation an amount of fluid varying from twelve ounces to one pint was removed, and the head then covered with strips of adhesive plaster, so as to form a complete cap. It was necessary, however, within the twelve hours succeeding each operation, to loosen the dressing, on account of either the occurrence of convulsions or symptoms premonitory of them. The head, within a week subsequently to each operation, regained its former size, and as there was no permanent benefit, this treatment was discontinued. She finally died of entero-colitis at the age of ten months and five days.

At the autopsy the distance from one auditory meatus to the other was twenty and a quarter inches; the occipito-frontal circumference, twenty-six and a quarter inches. The anterior fontanelle measured antero-posteriorly four and three-fourths inches; transversely, seven and three-fourths inches. The parietal bones were separated from each other to the distance of two or three inches, and they measured in length nine and one-half inches.

On opening the cranial cavity, seven pints, by measurement, of transparent fluid escaped, exposing a vast open space, at the bottom of which were the parts which constitute the floor of the ventricles, somewhat changed in shape, and from them, on either side, the hemisphere was spread in a lamina, so as to cover the internal surface of the cranial bones. The laminæ near the base of the brain measured in thickness from half an inch to one inch, and they gradually became thinner on approaching the vertex, at which point the brain-substance was exceedingly thin, so as to be scarcely demonstrable.

The brain had its normal vascularity and consistence, and the cerebellum, medulla oblongata, the base of the brain, and cranial nerves presented their usual appearance. On folding the brain together, it had the size, shape, and aspect of this organ in its ordinary development. Nothing unusual was observed in the membranes except their great expansion. The above case corresponds in its general features with most cases met in practice.

Diagnosis.—The ordinary form of congenital hydrocephalus, that in which the liquid occupies the interior of the brain, can, in most cases, be readily diagnosticated. If there is only a moderate amount of liquid, it may be confounded with hypertrophy of the brain. In hydrocephalus there is commonly more rapid growth, and greater expansion of the head; moreover, the enlargement occurs equally on all sides, while in hypertrophy, though all parts of the cranial vault are expanded, the enlargement is more at the vertex than elsewhere. The sign, however, of greatest diagnostic value is the direction of the axis of the eyes. In hypertrophy the axis is unchanged, while in this form of hydrocephalus, although the amount of liquid may be small, the change of axis occurs which is described above. In rachitis the volume of the head is often considerably enlarged, due sometimes, in part at least, to a deposit of calcareous matter on the exterior of the cranial bones. The differential diagnosis is based on the shape of the head, round in one, square or with prominences in the other, on palpation, direction of the eyes, etc. The smaller the amount of liquid, the greater the liability to error of diagnosis; but if the amount is inconsiderable and not increasing, little treatment is required, except hygienic and tonic, which is also proper in both hypertrophy and rachitis. If the liquid is exterior to the brain, as in the case represented on page 334, diagnosis may be difficult, but such cases are infrequent.

Prognosis.—This is unfavorable. The amount of liquid in congenital hydrocephalus, as already stated, commonly increases. The most favorable result is no increase, or but slight, in the quantity, while the natural growth of the infant continues, and thus the disproportion between the head and the rest of the system gradually disappears. This result is exceptional. Ordinarily, while the quantity of fluid increases, the nutrition of the body and limbs is more and more deficient. The patient, if not cut off by some intercurrent disease, finally succumbs with cerebral symptoms produced by pressure of the fluid. The majority of those affected with congenital hydrocephalus die in infancy, but some enter childhood, and occasionally one reaches even adult life. Cases of recovery have been reported, but if they were genuine, the disease was evidently mild, and the amount of liquid small or moderate.

Treatment.—It is a proper question, in many cases, whether anything should be done to relieve the hydrocephalic infant besides attending to its general health. The anxiety of parents, however hopeless the nature of the case if left to itself, reported recoveries, and the fact that we have medicines which in many instances diminish the amount of liquid in the internal cavities, incline us to the use of therapeutic measures.

We may attempt to diminish the quantity of fluid by the use of diuretics. Digitalis, squills, nitrate and acetate of potash, have been used. Probably the most efficient diuretic in these cases is iodide of potassium. This may be given in doses of one to two grains every two hours to an infant of six months. Constipation, if present, should be relieved by an occasional purgative. If it is tolerated, we may partially prevent the expansion of the head by a close-fitting cap. For this purpose strips of adhesive plaster, about one-third of an inch in width, should be applied so as to cover the entire head. The proper way of applying these is as follows: first, one strip from each mastoid process to the outer part of the orbit on the opposite side; secondly, from the back of the neck, along the longitudinal sinus, to the root of the nose; thirdly, over the whole head, so that the different strips will cross each other at the vertex; and, lastly, a strip long enough to pass three times around the head should be applied, passing above the eyebrows, the ears, and below the occipital protuberance. Too tight an application should be avoided, as it may give rise to convulsions or other cerebral symptoms. If the cap can be tolerated, and the general health is good, the prospect is more favorable; but usually, from the increase in the quantity of fluid, it is necessary in a few days to remove or loosen the plasters in order to prevent convulsions. If this treatment is not successful, we may finally resort to tapping. The mode of performing this operation has already been indicated in the case which I have detailed. No appreciable good result has followed the use of irritating or sorbefacient applications in this disease. Nutritious diet and attention to the general health are requisite.

CHAPTER VIII.

ACQUIRED HYDROCEPHALUS.

Hydrocephalus, or dropsy of the brain, may also occur in those who at birth are well formed and free from disease. Pathologists call this acquired hydrocephalus. It is in nearly all cases the result of disease, which is located sometimes within the cranium, but often in other parts of the system.

Causes.—The diseases within the cranium which most frequently produce serous effusion are the meningeal inflammations, both simple and tubercular, tumors or other causes which obstruct the venous circulation, and hemorrhagic effusion ending in the formation of cysts. Prolonged passive congestion often ends in transudation of serum through the coats of the capillaries. Therefore, all those causes of congestion, except such as have a transient or momentary effect, may be regarded as causes of serous effusion.

Among the diseases external to the cranium which produce serous effusion within or upon the brain, may be mentioned retropharyngeal abscess, tubercularization or inflammation of the bronchial glands, scarlet fever, and certain affections of an exhausting nature, especially protracted diarrhœal maladies. In four cases which have fallen under my notice, the cause was enlarged tubercular bronchial glands, which, by pressure on the venæ innominatæ, so retarded the flow of blood from the brain as to cause congestion and effusion. The causative relation of these glands to cerebral congestion is more fully described in our remarks in reference to this disease.

Dropsy of the brain is the common result of protracted diarrhœal affections in infancy, whether entero-colitis or non-inflammatory diarrhœa. It is preceded and accompanied by passive congestion of the cerebral veins and sinuses, due in part to feebleness of circulation in consequence of the exhausted state of the patient, and in part to the wasting of the brain, which always gives rise to more or less passive congestion, unless in young infants, in whom the cranial bones become depressed and override each other. Dropsy of the brain resulting from scarlet fever, and that peculiar circumscribed dropsy which results from hemorrhagic effusions, are described elsewhere.

A few cases have been related by different observers, Abercrombie among others, in which dropsy of the brain seemed to be essential. Nothing abnormal was observed, with the exception of serous effusion. But the reports of such cases are, for the most part, meagre; and, as Barrier has well said, we are not to accept such cases as examples of essential dropsy of the brain, unless the post-mortem inspection is so complete as to render it certain that there was no antecedent disease to which the dropsy was due.

Anatomical Characters.—Acquired hydrocephalus usually occurs after the cranial bones are firmly united, and, therefore, the shape of the head is not materially altered. If it occur at an early age, before there is firm union, there may be expansion of the cranial arch, as we sometimes observe in the circumscribed hydrocephalus resulting from hemorrhage. The effusion in acquired hydrocephalus occurs over the surface of the brain, in the subarachnoid space, or in the lateral ventricles. In the dropsy of protracted diarrhœal maladies, I have rarely failed to find the liquid over the whole superior surface of the brain as well as at its base.

The quantity of fluid in this disease is not large. In the majority of cases it does not exceed four ounces, and is often much less. It is transparent, or it has a slightly yellowish tinge. The membranes of the brain sometimes present their normal appearance, but in other cases they are injected. The brain itself, in some cases, presents an injected appearance from passive congestion of the veins and sinuses; but, in other cases, when there has been more or less compression of the brain, there is no more than the ordinary, or even less than the ordinary vascularity, and the convolutions are somewhat flattened.

SYMPTOMS.—The symptoms of the pathological state, which gives rise to the dropsy, precede and accompany those which are referable to the dropsy itself. The dropsy declares itself by symptoms which are alarming from the first.

In children old enough to speak, or manifest intelligence, there may be at first complaint of headache. The child is irritable, its mind confused or wandering at times, or there is actual delirium. After a time drowsiness occurs. The head seems too heavy for the body, and is buried in the pillow. In fatal cases the features become pallid, the pupils sluggish, and perception and consciousness are gradually lost. The child lies in profound sleep, which increases. There are now often convulsive movements, partial or general, and these soon end in coma, in which the patient dies.

PROGNOSIS.—Acquired hydrocephalus commonly ends unfavorably. The prognosis depends not only on the quantity of liquid, but on the nature of the cause. If the cause be venous obstruction within the cranium or thorax, as we have no means of removing it, death is inevitable. If it be an exhausting disease, as entero-colitis or scarlet fever, although the case is not absolutely hopeless, the prospect is still unfavorable. It is only favorable when the quantity of effused fluid is small, the system not much reduced, and the primary disease mild. When acquired hydrocephalus arises from meningeal apoplexy, the case is apt to be chronic. The symptoms and termination of this form of the disease are very similar to those in congenital hydrocephalus.

Treatment.—The treatment in acquired hydrocephalus must vary somewhat in different cases, according to the nature of the disease on which it depends. I shall indicate the treatment, in part at least, in the description of these diseases. Occasionally the condition of the patient is such that there is little to encourage us in the employment of any remedial measures. In vigorous children, if acquired hydrocephalus occur in connection with symptoms which indicate too active a circulation, moderate abstraction of blood from the temples at an early period may be useful, but cases requiring such depletory measures are rare. These cases require cold applications to the head; the bowels should be opened, and derivatives should be applied to the feet and back of the neck.

If the congestion be of a passive character, as when the circulation is obstructed by tumors or otherwise, benefit may still be derived from cold applications to the head, and derivatives to other parts. In most cases of suspected dropsy of the brain, unless the patient is in such a hopeless state that all treatment is obviously futile, vesication should be produced behind the ears. I prefer cantharidal collodion for this purpose. In addition to this treatment, diuretics should be employed, unless there is too great prostration, or the course of the disease is so rapid that no benefit can result in consequence of the tardy action of these agents. The best diuretics are the acetate of potash and iodide of potassium.

CHAPTER IX.

MENINGITIS, SIMPLE AND TUBERCULAR.

The most interesting and important disease of the cerebro-spinal system in early life, is that which is now designated meningitis. It is not infrequent. The mortuary statistics of this city show that it is the cause of death in from one in twenty-five to one in fifty of the entire number of deaths, the proportion varying somewhat in different years.

In 1768, the attention of the profession was particularly called to this disease, by Dr. Whytt, of Edinburgh. This observer, and the pathologists succeeding him, forming their opinion of meningitis from its most prominent anatomical character, namely, serous effusion, believed it a dropsy. They accordingly designated it acute hydrocephalus. During the last thirty years the profession have come to regard the disease as inflammatory, and hence the name by which it is now known, and which is believed to express its true pathological character.

Sometimes meningitis in children is an idiopathic disease. In other instances it occurs to those affected by tuberculosis, and in many, if not in all such patients, there are tubercles in or under the meninges, which excite the inflammation in the same manner as in the lungs they cause pneumonitis or pleuritis. Therefore two forms of meningitis are recognized, namely, simple and tubercular.

I have records of forty-five fatal cases of meningitis, some occurring in my private practice, and the remainder in institutions of this city with which I have been connected. Post-mortem examinations were made and recorded in thirteen of them. Twenty-five were under the age of one year, of which fifteen were apparently well when the meningitis commenced, belonging for the most part to healthy families; three were feeble and cachectic, but apparently without tubercles; and five had miliary tubercles in various organs, as shown by post-mortem examination. The condition of the other two was not recorded.

Of the twenty who were over the age of one year, the majority, namely, thirteen, presented a decidedly cachectic or a strumous aspect before the meningitis occurred, and a considerable number had symptoms of pulmonary tubercles. These statistics, as far as they go, show that simple meningitis predominates under the age of one year, and I may add eighteen months, while over that age the tubercular form is in excess.

The belief has prevailed in the profession, that tubercular meningitis does not occur in young infants. This idea is fallacious, although, as has been stated, meningitis under the age of one year is more frequently independent of tubercles or the tubercular diatheses than associated with them. Bouchut, speaking in reference to tubercular meningitis, says: "Up to this period it was not believed that this disease existed in young children, for no mention is made of it in the works of Denis and Billard. Still its existence at this age is, nevertheless, incontestable. MM. de Blache, Guersant, Rilliet and Barthez, and Barrier have observed several examples of it, and I have collected six cases of this disease in the practice of M. Trousseau. The youngest child was only three months old, and the eldest had arrived at the end of his second year. No statistics can be based on so small a number of facts; the only value they have consists in their overruling an opinion falsely accredited in medical science." I have witnessed the post-mortem of five cases of tubercular meningitis occurring in children under the age of one year, as is seen from the above statistics, and the age of one of these was only four months. In two, perhaps I should say three, of the five the presence of tubercles in the meninges was not positively demonstrated; but in all of the five cases miliary tubercles were present in the lungs and other organs, so that I did not hesitate to consider the meningeal inflammation of a tubercular character.

In patients over the age of eighteen months, although the proportion of tubercular to simple cases is larger than under this age, the excess is not so great, according to my statistics, as the remarks of some observers would lead us to suppose. There can be no accurate statistics of tubercular meningitis without careful post-mortem examination of the state of the brain and other organs in each supposed case, and this examination sometimes shows the meningitis to be simple, when the symptoms and physical signs had indicated its tubercular character. As an example, may be mentioned a case which occurred in the children's service of Charity Hospital, in March, 1868. This infant died at the age of twenty months, having, had a cough of moderate severity at least three weeks before death, and symptoms of meningitis about four days. It was considerably wasted, and was supposed to have tuberculosis. At the autopsy, no tubercles were found in any part of the body, but parts of both lungs were hepatized. A fibrinous deposit, varying in thickness, was found over the pons Varolii, the optic commissure, along the fissures of Sylvius, over the superior surface of the anterior half and also upon the posterior lobe of each cerebral hemisphere. As a careful examination failed to discover any tubercles, the meningitis was considered simple. Those who make these examinations, failing to find tubercles in the lungs and other organs in which they usually occur, should examine the lymphatic glands, for cheesy glands may be the cause of the formation of tubercles in the meninges while the organs of the trunk remain unaffected. The presence of cheesy glands in the absence of visceral tubercles, and with granulations upon the meninges, small, covered with fibrin, and of a doubtful character, goes far towards establishing the tubercular nature of the meningitis. I have met with one such case, the bronchial glands being cheesy.

Age.—The following table gives the age in meningitis, simple and tubercular, in forty-two cases in my collection:—

Cases.	Age.
1	2½ weeks. (Autopsy.)
2	2 months.
20	From 3 to 12 months.
10	" 1 year to 2 years.
5	" 2 years to 5 "
4	Over 5 years.
42	

Rilliet and Barthez have also published statistics of the age in meningitis. Their cases were observed chiefly in hospital practice, and the result is somewhat different.

In thirty-two cases of simple meningitis observed by these authors, eight were under the age of one year, six from two years to five, and eighteen over the age of five years. In ninety-eight cases of tubercular meningitis, there were two under the age of one year, fifty-one between the ages of one year and five, thirty-eight between the ages of five years and ten, and seven between ten and fifteen years.

Anatomical Characters.—The dura mater in meningeal inflammation is either not affected, or is affected secondarily. In many cases it retains its normal appearance, its internal surface remaining smooth and polished. In others it is more or less injected, and the surface is dim or lustreless. Ordinarily, also, the free surface of the visceral arachnoid continues unchanged, but sometimes it becomes dry and even cloudy or opaque, especially where it covers those parts which are most intensely inflamed. Exudation rarely occurs upon this surface, however intense the inflammation. Those who have had the most ample opportunities for observation record but few cases of it.

In both forms of meningitis the inflammatory action commences in the pia mater, and is usually confined to this membrane. In its meshes, or underneath them, the lesions occur which characterize this disease. The pia mater is injected over a greater or less extent of surface, usually in tubercular meningitis, at the base of the brain alone, or at the base of the brain and in less degree along the sides of the organ. The inflammation is ordinarily most intense around the pons Varolii, in the subarachnoid space, and along the fissures of Sylvius. In simple meningitis the inflammation may also be at the base, but in other cases it is at the vertex. It is at the vertex when the cause is exposure to the sun's rays. In addition to the augmented vascularity of the pia mater, we find an effusion of serum, fibrin, and pus, the quantity and proportion of these elements varying greatly in different cases.

The exudation of fibrin is greatest along the course of the vessels, and in the depressions between the convolutions, and the opacity is most marked in these situations. Pus, when present, is almost semi-solid, from the small proportion of liquor puris which it contains, even in recent cases. If the disease have continued several days, the liquor puris may be mostly absorbed, and the pus cells becoming shrivelled, irregular, and aggregated, may resemble closely the cheesy transformation of tubercle cells.

The fibrinous exudation presents features of interest. It does not usually attain much thickness, but by its opacity it conceals from view the brain underneath. If it occur in the fissures of Sylvius, the anterior and middle lobes are united by it. It is usually infiltrated through the substance of the pia mater. Sometimes little masses of variable size, often not as large as a pin's head, appear at the point of inflammation. These masses are firm, of a whitish color, or a light yellow, and their number varies in different cases. They consist of a firm, homogeneous substance, containing granular matter, and cells which often bear a close resemblance to tubercle corpuscles, but are distinct. These corpuscular bodies are plastic nuclei or plastic cells, often shrunken. It is seen, then, that there are two morbid products which may be mistaken for tubercle: one, pus which has been in great measure deprived of its liquid element; the other, plastic nuclei collected in little bodies, so as to resemble the ordinary form of crude tubercle. I once carried to one of the best microscopists and pathologists of this city some of the exudation from a case of meningitis, the cellular element in which could not readily be distinguished from shrunken tubercle corpuscles. The exudation was from a child two years and eight months old, with good health previously to the meningitis; without tubercles in any part of the body, with parents healthy, and with no predisposition to tubercular disease. This microscopist, not knowing the history of the case, or character of the family, and ignorant, like all of us at that time, of the true tubercle cell, pronounced the exudation tubercular after a careful examination with the microscope. Bouchut says: "The whitish miliary granulations which are observed on the surface of the pia mater have a certain consistency and tenacity which render them difficult to tear with the needles used for the preparation for the microscope. These bodies are formed: 1. Of fibro-plastic elements, whether nuclei or fusiform fibres; oval-shaped cells are generally present, but not always. The nuclei are oval or spherical, generally very small—that is to say, they hardly exceed in diameter 0.008 mm. to 0.009 mm. The presence of these little spherical nuclei must be insisted on, because, with a less power than 5.50 diameters, it would be sometimes impossible to establish the differences which separate them from the elements of tubercle; the fusiform fibres are small and rare. 2. There exists a considerable quantity of amorphous homogeneous matter, in which minute granulations are scattered: it is very dense, and keeps the other elements strongly united together, so that it is difficult to isolate them completely. 3. Vessels are very rarely observed; the fibres of cellular tissue are also rare, or altogether wanting."

There being two microscopic elements which are distinct from tubercular formations, but are liable to be mistaken for them, namely, shrivelled pus cells and plastic nuclei, more or less altered, it is seen, in part at least, why the older writers, and some of a more recent date, either hold that all meningitis is tubercular, or that there are comparatively few cases of the simple form.

On the other hand, there are cases of true tubercular meningitis which, even with a pretty careful microscopic examination, might be, and probably often have been, regarded as simple. In order to a better understanding of this subject, I may be permitted to repeat certain facts already stated in the article on tuberculosis. The views of pathologists in reference to what is the primary form of tubercle, and what is and what is not tubercular matter, have recently undergone a great change. It is now believed that the tubercle cell is a round, pale, slightly granular cell, identical in appearance with the normal cell of the lymphatic glands, being in the average somewhat smaller than the white corpuscle of the blood; that it is produced mainly from the nuclei of the connective tissue by proliferation; that it is vitalized like other cells, and, of course, has functional activity; that the true, the living cell, is found only in the so-called gray, semi-transparent tubercle. It is furthermore believed, that what has heretofore been considered the tubercle cell, namely, the irregular, sometimes angular, sometimes oval cell—without, indeed, any typical form—may be a dead, shrivelled, and altered tubercle cell, or a dead, shrivelled, and altered pus or other cell. If, therefore, such cells are found in the meshes of the pia mater, we cannot determine from the microscope their true character. We can only form our opinion in reference to their nature from concomitant circumstances, or from discovering in connection with them the true tubercle cell. Those products which have been designated crude tubercle and tubercular infiltration, contain these shrivelled cells, or shrivelled nuclei; and they may have a tubercular origin, or, on the other hand, an inflammatory origin, without either the tubercular product or diathesis.

In the tuberculosis of young children, I have found, in a large proportion of cases in which I have had an opportunity to make post-mortem examinations, miliary tubercles disseminated through the lungs, and perhaps other organs, in small masses, many of them not larger than a pin's head, and some occurring as mere specks scarcely visible. These minute tubercular formations have ordinarily been semi-transparent, and sometimes even transparent like minute drops of water, and containing the true and unchanged tubercle cell. Now if in such a case meningitis occur, we may find the tubercle cell in or with the fibrin at the base of the brain. But failure to find it, even with protracted microscopic examination, does not prove its absence from this locality, for I consider it almost impossible to discover in the midst of the fibrinous exudation such minute points of tubercular matter as are seen in the lungs, liver, or elsewhere. In view of these facts, I know no better rule for the practitioner, who cannot command the time for thorough microscopic examinations, than to consider as tubercular all cases of meningitis in which tubercles or cheesy glands are observed, in whatever part of the system, and consider as examples of simple meningitis all those cases in which no tubercles are apparent in the meninges or in any other organ of the trunk.

The pia mater is often firmly adherent to the brain at the seat of inflammation, so that on raising it a portion of the brain may be detached and removed with it. The extent of the inflammation varies much in different cases. There may in extreme cases be pretty general inflammation of the pia mater. In cases of such extensive meningitis, the symptoms are apt to be severe, and the course of the disease rapid. Thus, in the month of April, 1866, a girl eleven years of age, in the Protestant Episcopal Orphan Asylum of this city, had complained occasionally of dizziness, but was otherwise in good health, cheerful, and with excellent appetite, till Thursday, when she was affected with vertigo, more persistent than previously, and with headache. At 2 P. M. on the following day she was seized with general convulsions, and continued insensible or nearly so, with occasional convulsive movements, till Monday, when she died comatose. The pia mater at the vertex, sides, and base of the brain had a cloudy appearance, and underneath it, in places, was a thick creamy substance in small quantity, which, examined by the microscope, proved to be pus, the largest amount being near the pons Varolii. There was no tubercle under the meninges or elsewhere, and no appreciable fibrinous exudation. The inflammation in this case was obviously intense. The only additional lesions noticed were moderate congestion of the brain, and an increase in the quantity of the cerebro-spinal fluid.

If the disease is protracted three or four weeks, which is rare, or even less time, the exuded substance may undergo further changes, such as occur in simple exudations in other parts of the system. Thus, on the 30th of April, 1860, we made the post-mortem examination of an infant at the Nursery and Child's Hospital, who had symptoms of cerebral disease, it was stated, for several weeks, but the exact time was not ascertained. Prominent among the symptoms referable to the cerebro-spinal system towards the close of life were the hydrocephalic cry and rigidity of the neck. The appearance at the autopsy was remarkable. The anterior half of the brain was completely encased in a deposit which had nearly the appearance of lard. It filled the fissures of Sylvius, and appeared slightly on the anterior aspect of the cerebellum. Examined under the microscope, this substance was found to contain numerous cells, among which could be distinguished some resembling pus cells, but nearly all had undergone more or less fatty degeneration. Here and there was seen a large cell containing numerous small oil globules, the compound granular cell of pathologists.

The brain itself in meningitis is usually injected. On making an incision through it, red points are seen upon the cut surface, which indicate the seat of the congested vessels. The inflammation rarely extends to the walls of the ventricles, but the choroid plexus is injected. In exceptional instances pus or fibrin is found in the lateral ventricles. In the infant two and a half weeks old, whose case has already been alluded to, about two ounces of purulent fluid escaped on opening the left ventricle. A small amount of liquid of a similar character was contained in the right ventricle. The distension of the lateral ventricles with serum is one of the common results of meningitis. This fluid is clear or straw-colored, or it is turbid in consequence of being mixed more or less with the softened brain-substance. The quantity does not exceed two, three, or four ounces, and is often not more than one ounce or an ounce and a half. The distension of the two ventricles is ordinarily uniform, as they are united by the foramen of Monro, but now and then one ventricle is found more distended than the other. If there is considerable effusion, the brain is compressed and the convolutions have a flattened appearance, unless the cranial bones are still separated so as to yield to the pressure. If the sutures and fontanelles are open, the cranial arch is expanded, sometimes quite perceptibly to the eye. From the same cause the anterior fontanelle, if open, is elevated. The foramen of Monro is enlarged according to the amount of effusion, and the portions of the brain which separate the ventricles are sometimes lacerated. In many cases the cerebral substance surrounding the lateral ventricles is softened. The softening is found in all degrees, from the least appreciable deviation from the normal consistence to a state of diffluence so that the brain presents the appearance of cream. Hypotheses have been advanced to explain the cause of this change in consistence, which are not entirely satisfactory. Whatever the explanation, the fact is attested by all observers, though there are exceptional cases. Thus Dr. West has records of the condition of the brain in fifty-nine cases, in thirty-seven of which there was considerable softening, and in the remaining twenty-two the consistence was normal.

Causes.—The causes of simple meningitis are not fully ascertained. Active cerebral congestion frequently occurring, is probably a common direct cause. I have known the inflammation in at least three instances to occur in infants from four to eight months old, who, a month or six weeks previously, had severe and protracted attacks of bronchitis. The disappearance of eruptions upon the scalp prior to the commencement of the inflammation, is a fact often observed. I have noticed this before the commencement of simple meningitis, as well as before meningitis, if not tubercular, at least occurring in a decidedly scrofulous state of system. I have already alluded to a case in which the inflammation, occurring in the pia mater at the vertex, apparently resulted from frequent exposure in the months of August and September bareheaded to the sun's rays.

The cause of tubercular meningitis need not detain us. It is sufficiently dwelt upon in the foregoing pages.

Premonitory Stage.—Meningitis is usually preceded by symptoms which, if rightly interpreted, are of the greatest value. In most cases of both the simple and tubercular forms, which I have seen, there was a prodromic period, varying from a few days to as many weeks. The symptoms of this period are obscure, and are apt to be mistaken for those of other and distinct affections.

The child in whom meningitis is approaching, loses his accustomed vivacity and cheerfulness. He has a melancholy and subdued appearance, being quiet for a few minutes and then fretful, without apparent cause. He can sometimes be amused by his playthings or companions for a brief period, when he turns from them with evident displeasure. Unexpected and loud noises and bright lights are evidently painful. If old enough to describe his sensations, he complains of transient dizziness, and at other times of headache. His ill-humor, if his wishes are not immediately gratified, or if they are denied, is often scarcely endurable on the part of friends who are ignorant of the cause. There is great difference, however, in different cases, as regards this symptom. Some are inclined to be taciturn and quiet, while others are almost constantly fretting. The appetite is capricious; at one time it is pretty good, at another it is poor or even entirely lost. The patient may take a few mouthfuls of food, or, if an infant, nurse for a moment, when his hunger appears satisfied, and he will take nothing more. The bowels are regular or inclined to constipation. The pulse is natural, or it has times of acceleration, especially in the latter part of the day and towards the close of the premonitory stage. The duration of this stage is very different in different cases. Upon an average it is perhaps about two weeks, but it is often longer. In tubercular meningitis the symptoms, both during the inflammation and previously, are apt to be complicated by those which arise from tubercles in other parts of the system.

Unless the prodromic period is of short duration, the effect of imperfect nutrition is obvious before it closes. The flesh becomes soft and flabby, or there is actual emaciation, though generally slight. The patient loses his strength, becoming less able to stand or to walk, and more easily fatigued. Occasionally, especially in the simple form, premonitory symptoms are absent, or are slight and of short duration.

SYMPTOMS.—Dr. Whytt, living in the last century, when the tendency was rather to refinement than to simplicity in classification, divided meningitis into three stages, according to the symptoms, especially the pulse. Many subsequent writers, following Whytt's example, have recognized three stages, based not upon the anatomical character of the disease, but upon the succession of symptoms. Such division of meningitis is in great measure arbitrary, since in one case the same symptom occurs at an earlier period than in another.

When the premonitory stage has passed, and inflammation is developed, some of the symptoms which were previously present remain and are intensified, and other new and more characteristic symptoms appear. There are now fewer intervals of apparent improvement. The child is quiet, often lying with its eyes shut. If aroused, he has a wild expression of the face, and is irritated by attempts to engage his attention or amuse him. He rarely smiles, or takes his playthings, or he notices them for a moment, when he turns away with disgust. During sleep there is often at first a placid expression of countenance, but when aroused he has the aspect of real sickness; the eyebrows are sometimes contracted, as if from headache; the features wear a melancholy look, and are turned away to avoid the gaze of the observer or to shun the light. If the anterior fontanelle is open, it is observed to be prominent and pulsating forcibly. If consciousness is not lost, and the patient is of sufficient age, he complains of headache, or of pain in some part of the body. The tongue is moist, and covered with a light fur; the appetite is lost or poor; there is seldom much thirst; more or less nausea and constipation are present. As the inflammation continues, and usually within three or four days from its commencement, symptoms arise which dispel all doubts, if there were any, as to the nature of the disease. The vital powers are now evidently beginning to yield. The surface generally is more pallid, and there is the curious phenomenon of the sudden appearance, and, after some minutes, disappearance, of spots or patches, or even streaks or active congestion upon the face, forehead, or the ears. These, having a bright red color, contrast strongly with the general pallor. Ordinarily they are irregularly circular or oval, and from one inch to an inch and a half in diameter. A red spot or streak is also produced if the finger is pressed upon the surface or drawn forcibly across it. It continues a few minutes and then gradually fades. Trousseau calls attention to this fact as a diagnostic sign.

Another curious phenomenon is the variation in temperature. The face and limbs at one time feel quite cool, and after some minutes, without any excitement or other appreciable cause, the temperature rises, so that the surface is warm to the touch.

Consciousness, in severe cases, may be lost at an early period. On the other hand, I have known it in a case of moderate severity to remain, though partially obscured, till within twenty-four or thirty-six hours of death. The patient will usually open his mouth for drinks, which are placed to his lips, when there is no other evidence of intelligence, and when sight and hearing are evidently lost.

The loss of the senses constitutes an interesting but melancholy feature of the disease. Among the first unequivocal symptoms, and frequently the very first, are such as pertain to the eye. This organ should be watched from day to day when the diagnosis is uncertain. Deviation from its normal state affords evidence of meningitis. The pupils are seen to dilate or contract sluggishly by variations in the intensity of the light, or they are not of the same size with those of another individual to whom the same amount of light is admitted. Sometimes the first perceptible deviation from the normal state is an inequality in the size of the pupils; while in others oscillation of the iris is observed. At a later stage, not generally till convulsions have occurred, the parallelism of the eyes is lost, and in most patients they have an upward direction. After effusion has occurred, the pupils are commonly dilated. As death approaches, the eyes become bleared, and a puriform secretion collects in the inner angle of the eye and between the eyelids. This secretion is not abundant, but it is sometimes sufficient to unite the lids. The sense of hearing is probably lost as soon, or nearly as soon, as that of sight, but the sense of touch continues longer. The tongue is covered with a moist fur, unless near the close of life, when it is sometimes dry. The appetite is gradually lost, but often drinks are taken with apparent relish, even when there is no other evidence of consciousness. There are two symptoms pertaining to the digestive system which are rarely absent, and which possess great diagnostic value; one is vomiting, the other constipation. In some patients, irritability of stomach begins at so early a period that it is really prodromic; it is rarely absent. Barrier collected the records of eighty cases of meningitis, in seventy-five of which this symptom was recorded present. It is due to the intimate relation existing between the stomach and brain, through the ganglionic system of nerves. The vomiting occurs without effort, and usually at intervals, for several days. It is a sudden ejection of the contents of the stomach, apparently without preceding or subsequent nausea. It contrasts, therefore, with the vomiting due to an emetic, which is attended by distressing symptoms. With some it occurs frequently, with others not more than two or three times daily. Commencing in the first stages of meningitis, or even prior to it, it occurs less often as the drowsiness becomes more profound, and finally ceases. Constipation is also present, usually from the commencement of the disease. It is one of the most constant and persistent symptoms, continuing through the entire sickness, unless relieved by medicine, or unless there is a coexisting diarrhœal affection. Often, when diarrhœa precedes the meningitis, it ceases the moment the latter commences. The constipation in this disease is easily overcome by purgatives. Several writers speak of retraction of the abdomen as a sign of meningitis. A hollow or sunken appearance of the abdomen, according to Gölis, aids in distinguishing meningitis from fever. The anterior abdominal wall approaches the spine, so that the pulsations of the abdominal aorta are distinctly felt. Rilliet and Barthez, who have rarely observed this retraction except in cerebral diseases, attribute it to the state of the intestines rather than to the action of the abdominal muscles.

The pulse in the first stages of meningitis is accelerated, or it is nearly natural during certain hours and afterwards accelerated. When the disease has continued a few days, often not more than three or four, the pulse undergoes a marked change. It becomes slower and at the same time irregular. The irregularity usually consists in an intermittence of the pulse after each six or eight beats. Sometimes the force of the pulse varies, so that a feeble pulsation is succeeded by one of greater volume and strength. The decrease in the frequency of the pulse cannot fail to arrest attention. From 110 or 120 beats per minute in the first stage of the inflammation it often descends to a frequency even less than the normal adult pulse. At an advanced period, as death approaches, the pulse again becomes accelerated and feeble.

The change in respiration is as decided as that of the pulse. In the beginning of the meningitis respiration is sometimes moderately accelerated, but in other cases it is natural. When the disease has continued a few days, the time usually varying from three or four to more than a week, a marked alteration occurs in the respiratory movements. Their rhythm, like that of the pulse, is disturbed. The breathing is irregular, intermittent, and accompanied by sighs. This change in pulse and respiration corresponds with the loss of consciousness, and shows that the brain is becoming seriously involved.

When the pulse and respiration undergo the changes which have been described, another prominent and grave cerebral symptom is often present, namely, convulsions. Its occurrence diminishes greatly the prospect of a favorable issue. The severity and extent of the convulsive movements vary in different cases. They may be partial or general. Their duration is often brief, but they recur three or four times through the day. They are preceded by cephalalgia in those old enough to express their sensations, and often by drowsiness. Each convulsive attack ends in still greater drowsiness.

With this group of symptoms another should be mentioned. I refer to the hydrocephalic cry. At intervals the patient, without being disturbed, and without any change in symptoms, utters a scream or sharp cry, and immediately relapses into his former state. This cry is more common in the first stages of the disease than subsequently, and in some it is absent or is not a marked symptom. The glandular system participates in the general loss or derangement of function. Tears are seldom shed, even when the child is much irritated, and the urinary secretion is greatly diminished. The small amount of urine passed sustains an important relation to the progress of the disease and the therapeutics.

The patient usually lingers several days after the pulse and respiration are changed in the manner stated. The drowsiness becomes more profound, the vomiting ceases, as well as the convulsive attacks, and sensation and consciousness are entirely lost. But even in this state, if nutriment and stimulants are administered with regularity, the child often lives several days longer than the friends believed to be possible. At length increasing feebleness and rapidity of pulse and coldness of the face and limbs indicate the near approach of death, which occurs in a state of coma.

The symptoms described above are such as occur in ordinary cases of meningitis, and in the order which I have indicated. But *he* will be disappointed who expects that the above description will apply to all cases.

Meningitis may be so violent and rapid that both the character and succession of symptoms are different from those which have been stated. Thus, I have related the case of a girl, who, with no prodromic symptoms excepting occasional dizziness and slight headache, was taken sick on Thursday, had convulsions on Friday, and from this time continued either in convulsions or coma till her death on Monday. Again, even in cases of the usual duration and anatomical character, some of the most prominent symptoms upon which we rely for diagnosis may be lacking. The following was a case of this kind:—

CASE.—On the 5th of April, 1862, I was asked to see a boy two years and eight months old, of healthy parentage, and who, during the preceding year, had been in uniform good health, but previously had had two or three severe attacks of sickness. His head was of large size, and whenever much indisposed he usually had symptoms premonitory of convulsions, which were always, however, prevented.

One night, in the latter part of March, his parents noticed that his sleep was restless, but on the following day he seemed entirely well, and the restlessness at night was attributed to a late and hearty supper. On succeeding nights, however, he was restless, and, when questioned, complained of pain in the abdomen. In a few days he was observed to be drooping in the daytime, and his appetite was not quite so good as previously. He had continued in this way about a week when my first visit was made.

The abdominal pain had at this time become more constant, but was never severe or accompanied by moaning. When asked where he felt sick, he placed his hand upon the epigastrium, pressure upon which was sometimes tolerated, but at other times painful. The following symptoms were noted: tongue slightly furred, anorexia, thirst, constipation, scantiness of urine, no headache or unusual heat of head in any part of his sickness. He vomited at intervals from about the seventh to the tenth of April, when the irritability of stomach ceased, and there was no return of this symptom.

About April 7th, the respiration was first observed to be irregular and sighing, and the pulse intermittent. These symptoms, so tardily developed, were the first which indicated cerebral disease. He now lay most of the time in bed, with eyes closed, surface commonly pale, with occasional rose-colored spots or patches upon the cheek or forehead. The pupils responded to light in the usual manner till near the close of life, but bright lights were painful; the last two or three days of his life the left pupil was more dilated than the right. He had no convulsions or any spasmodic movement, and was conscious till within a few hours of death; the mother states that there was unequivocal evidence of his recognition of her on the last day of his life. He died April 17th, nearly three weeks after the commencement of the disease, and ten days after the commencement of symptoms which were distinctly referable to the cerebro-spinal system.

Autopsy.—Abdominal organs healthy, though epigastric pain had been so constant and prominent a symptom; brain and its membranes somewhat injected. The meninges covering the base of the brain from the most prominent part of the pons Varolii to the first pair of nerves presented evidences of inflammation. There was such opacity of the pia mater in places, as to conceal the brain from view. The anterior and middle lobes of each hemisphere were glued together by fibrinous exudation, and on the left side, along the fissure of Sylvius, was a thick deposit of the same character. The lateral ventricles contained about an ounce of clear serum, and about half an ounce escaped from the base of the brain. The foramen of Monro was considerably enlarged, and the brain-substance surrounding the lateral ventricles was, perhaps, somewhat softened, but not in a notable degree.

In this case it is seen that the prominent symptom, and, indeed, almost the only marked symptom in the first stages of the disease, was pain in the abdomen, and yet the abdominal organs were healthy. At the very moment when it was highly important that a correct diagnosis should be made, the evidences of cerebral disease were lacking. This case is, therefore, interesting on account of the variation in symptoms from those in the usual form of meningitis. There were no convulsions, and consciousness was retained as well as vision till near the close of life, and yet the lesions were such as are commonly present in meningeal inflammation. In such cases a wrong diagnosis is apt to be made, to the injury of the patient and the reputation of the physician.

Occasionally meningitis may continue so long as to almost justify its being called chronic, even when there is a large amount of exudation upon the pia mater. In meningitis which terminates favorably, there is a gradual subsidence of symptoms. I shall describe more fully this termination in speaking of prognosis.

DIAGNOSIS.—It is of the utmost importance to diagnosticate meningitis in its first stages, since treatment, to be successful, must be commenced early. Some writers describe at length the means of diagnosticating the simple from the tubercular form of the disease. Differential diagnosis is often difficult, and sometimes impossible; but it matters little, practically, whether the form of the disease is ascertained. On the other hand, it is very important, in order that the treatment be appropriate, to diagnosticate the premonitory or initial stage of meningitis from certain other affections not located within the cranium. Sometimes remittent or continued fever, or constitutional disturbances arising from irritation in the digestive system, simulate closely incipient meningeal disease, so that the greatest care and discrimination are required in order to make a correct diagnosis. Within a comparatively recent period I have known, in three different instances, experienced physicians of this city mistake commencing meningitis for fevers, not aware of the serious error they had made till the inflammation had reached a stage from which recovery was impossible. In order to make a correct diagnosis in the premonitory or initial stage of meningitis, the physician should take time to observe the physiognomy, and note every symptom. More than one protracted visit is often required to remove all doubt as to the exact pathological state.

Meningitis is usually preceded and in its commencement accompanied by greater restlessness, fretfulness, intolerance of light, and greater variation of symptoms than most other diseases. One familiar with the physiognomy of infancy and childhood, will discover in the features indication of greater suffering, of more serious sickness, than is commonly present in other and distinct affections whose symptoms are similar.

Sometimes the sudden disappearance of a chronic eruption upon the scalp will aid in the diagnosis. This is a sign of importance, taken in connection with the symptoms. Headache and vomiting, symptoms of early occurrence, should especially arrest attention, or, in absence of headache, pain of a neuralgic character in some other part. If there is doubt at first, careful and repeated examinations, if we are familiar with the various signs and symptoms of meningitis, will soon remove all uncertainty. When the eyes become affected, the respiration and circulation irregular, and especially when convulsive attacks begin, diagnosis is easy. In fact, an incorrect diagnosis would then be unpardonable; but, unfortunately, if proper treatment has not been commenced till this period, it will be of little service.

PROGNOSIS.—Meningitis is one of the most fatal diseases of early life. Whether the form is simple or tubercular, if the initial stage has passed without proper treatment, death may be considered inevitable. Tubercular meningitis, however early recognized, is rarely amenable to treatment. M. Guersant (*Dic. Med.*, t. xix. p. 403) believes that recovery from the first stage of tubercular meningitis is possible. "In the second stage," says he, "I have not seen one child recover out of a hundred, and even those who seemed to have recovered have either sunk afterwards under a return of the same disease in its acute form, or have died of phthisis. As to patients in whom the disease has reached its third stage, I have never seen them improve even for a moment." The very few reported cases which resulted favorably may have been, as M. Guersant has intimated in the context, cases of the simple form. Rilliet and Barthez believe that in a few instances tubercular meningitis has been cured in its first stages, but they state also that the disease is apt to return.

The prognosis in simple meningitis is not so unfavorable, provided treatment is commenced at a sufficiently early period. It is now generally admitted that the simple form may not infrequently be averted, when threatening, and even arrested in its incipiency. In many such cases we cannot, from the nature of the disease, be certain that the diagnosis is correct. But when we see children relieved, who present precisely those premonitory and even initial symptoms which occur in meningitis, we must believe that at least some of them would have had the genuine disease if not relieved by the measures employed. That recovery is possible from simple meningitis in its commencement, is also obvious from the fact that a few recover even from the advanced stage, when there can be no error of diagnosis.

I have known but two recoveries from meningitis when it had continued so long and had reached that degree that the function of the brain and cranial nerves was impaired. One of these recovered with the permanent loss of sight, the other with the loss of hearing. Both seem to have ordinary intelligence. Another case has been communicated to me, in which the patient, a little girl, recovered completely, but for several months after the attack seemed nearly idiotic.

Sometimes even in the second stage of meningitis, treatment properly employed is attended by amelioration of symptoms. Though such improvement may serve to encourage physician and friends, it should not be the basis of a favorable prognosis unless it continue three or four days.

Apparent improvement during a few hours or a considerable part of a day is not unusual in those who finally die. Thus, in an infant whose bowels were previously confined, I have known the pulse and respiration to become more regular and the symptoms generally improve, though only for a brief period, by the action of a purgative. Dr. Watson says of the advanced stages of this disease, it is "often attended with remissions, sometimes sudden, and sometimes gradual, deceitful appearances of convalescence. The child regains the use of its senses, recognizes those about him again, appears to his anxious parents to be recovering, but in a day or two it relapses into a state of deeper coma than before. And these fallacious symptoms of improvement may occur more than once."

Most fatal cases of meningitis terminate between the third or fourth and the twentieth day, the duration varying according to the extent and intensity of the inflammation, and the vigor and age of the patient. But there are cases in which it may continue much longer. It is surprising sometimes how long the patient lives, when the symptoms are such that death seems impending. Sensation and consciousness may be extinguished, convulsions occur at intervals, and the surface have acquired almost a cadaveric aspect, and yet the patient lives on. Rilliet and Barthez say, "Often have we inscribed upon our notes *death imminent*, and been astonished the next day to find still alive children to whom we had scarcely allowed two hours of life." The symptom which I have found to be the most reliable prognostic of the near approach of death, has been a pulse gradually becoming more frequent and feeble, though other symptoms remain as before. This change in the pulse is usually very apparent during the last twenty-four hours of life.

TREATMENT.—Such remedial measures should be prescribed during the premonitory stage as are calculated to relieve the fretfulness or irritability of temper, and quiet the action of the brain, and, at the same time, produce a derivative effect from this organ. To this end the patient should be kept from all causes of excitement, and the bowels should be opened daily, if not naturally, by the use of proper medicines. A mustard foot-bath at night and occasionally through the day is useful, as it produces both a derivative and soothing effect. It will commonly produce a few hours' undisturbed rest, while all other measures except medicine fail. If dentition is taking place and the gums are swollen, it is sometimes proper to scarify them. This operation, by diminishing the swelling and tenderness, may diminish the irritability of system. In most cases in which there are symptoms threatening meningitis, moderate counter-irritation behind the ears is required. The fact that the disease sometimes follows the recession of cutaneous eruptions of the scalp shows the importance of this remedy; but it is not advisable to produce counter-irritation over a large surface, since this may increase the restlessness of the child, and aggravate rather than relieve the state of the head. West says: "Another inquiry that you may put is, when are you to employ blisters? Certainly not at the beginning of the disease, when they would increase the general irritation, and do more harm than good. At a later period they may be of service, when the excitement is about to yield to that stupor which usually precedes the state of complete coma. They should then be applied to the nape of the neck or to the vertex." Vesication produced at so late a period as Dr. West recommends, can produce little effect in arresting the disease; besides, counter-irritation at the vertex or back of the neck is too far removed from the seat of the disease. I have never known it, when employed in the manner which I shall advise, to increase the restlessness. I have many times prescribed vesication—sometimes when the symptoms passed off and there was restoration to health; at other times, when meningitis supervened with its usual result—and I have never regretted the prescription. Cantharidal collodion applied with a brush answers the purpose, and from the convenience of its application is to be preferred. It does not vesicate deeply, or produce a troublesome sore. If symptoms indicating the approach of meningitis continue, iodide of potassium should be given in decided doses. We will speak more of this in our remarks on the treatment of the disease.

Many children who are threatened with meningitis are scrofulous. They have already shown symptoms of tubercular disease. They are, perhaps, to a certain extent, emaciated, and may have been affected with a cough. The premonitory symptoms in these children indicate the approach of the tubercular form of meningitis, and a more sustaining course of treatment is required than in those who are robust. To such children cod-liver oil may be profitably given, three times daily, together with the syrup of the iodide of iron, or iodide of potassium. They should also be taken into the open air, with proper precautions, and every hygienic measure should be employed which will be likely to invigorate the system without exciting the brain.

Loss of blood is not, in general, required during the prodromic period nor in the disease. Those of a strumous cachexia, or those, whether strumous or not, who are under the age of two years, do not, unless in very rare instances, require depletion by leeches, much less by venesection. There is one class of patients in whom the early loss of blood may, doubtless, be of service, namely, those who in a state of robust health are suddenly seized with the inflammation. Leeches should then be applied to the head of the patient, if he is seen at an early period.

The propriety of using opium to allay irritability of system in those threatened with meningitis is viewed differently by physicians. Bouchut says: "Opiates have the inconvenience of increasing constipation, but they are very useful in calming the state of cerebral excitement of young infants. Laudanum should be given in a draught in a narcotic dose, at short intervals, gradually increasing the dose of it until sleep is obtained." I prefer, in order to relieve the restlessness, the use of hydrate of chloral. From one to three, or even five, grains may be given, and, if necessary, repeated after some hours.

Often, notwithstanding the measures employed, the patient grows worse, the symptoms become more continuous, others more alarming arise, and meningitis declares itself. For internal treatment, there are two medicines which are extensively used by the profession—in fact, to the exclusion of nearly all others—the one calomel, the other iodide of potassium. Those who employ the iodide as the main remedy, commonly also prescribe single doses of calomel occasionally, as an eligible purgative when there is constipation, so that half a dozen or more doses may be given in the course of the disease. By those who depend upon calomel as the main remedy, it is given not only to keep up a relaxed state of the bowels, but also in the belief that it arrests the exudation from the meninges. These last give it daily in small doses.

My observations have not been favorable to the use of calomel, except as an occasional purgative. When administered daily, it has a very depressing effect, and it is to be recollected that this is a disease in which the vital powers rapidly sink in consequence of the loss of appetite and the frequent vomiting. In tubercular meningitis, it is obvious that any remedy which greatly reduces the strength may promote the formation of tubercles, and thereby diminish the chances of recovery. Cases have occurred in which calomel was given at short intervals for several successive days, and though the meningitis seemed to be relieved, death resulted from sheer exhaustion or from some intercurrent affection, the result of exhaustion, or of the remedy. In one case related to me, fatal gangrene of the mouth, the result of the mercurial treatment, supervened after the meningitis had apparently subsided. Unless, therefore, statistics show that a larger proportion recover by the use of calomel than by iodide of potassium, we should prefer the safer agent. Now, while certain patients recover who exhibit symptoms which are premonitory of meningitis, and a few from meningitis itself, by the use of iodide of potassium, restoration to health by the calomel treatment is certainly very rare, if there are unequivocal evidences of meningeal inflammation. Dr. Whytt, who lived in the time when calomel and loss of blood were commonly prescribed not only in this but in other diseases, never saw a favorable case. Moreover, physicians of the present time incline more and more to the use of iodide of potassium, and the rejection of calomel, as the main remedy.

The iodide of potassium should be given early in the premonitory period. If, by a careful examination, the absence of any other local disease or of a constitutional affection which might give rise to similar symptoms is ascertained, this agent should immediately be prescribed. The symptoms at this early period are often so obscure that a positive diagnosis cannot be made; but it is better to give the iodide even if the diagnosis is wrong, and no meningeal disease is threatening, than to err on the other side and withhold its use in the prodromic and initial period of the true disease. An infant from six to twelve months old should take two grains every two hours, and older children a proportionate dose. Larger doses may in some cases be administered. When thus given, the iodide soon produces an impression on the system, and especially on the renal secretion, the quantity of urine, previously scanty, being largely increased. If with the regular and continued use of potassium there is no improvement, the case is without remedy.

Throughout the disease, as well as in its commencement, the iodide of potassium should, therefore, be employed until it is obvious that there is no chance whatever of improvement, when medication may properly be discontinued. The best remedy for the convulsions which sooner or later occur in most cases, is hydrate of chloral given in small doses. The apartment should be dark and quiet; a moderate degree of vesication should be produced behind the ears, and the head be kept cool. In simple meningitis occurring in children three or four years of age or older, previously healthy and robust, it is proper to place a bladder with pounded ice over the head, separated perhaps by two or three thicknesses of muslin, provided that the temperature is elevated, as it ordinarily is. If there is not much heat, or if the child is considerably prostrated, a cloth wrung out of cool water will be sufficient. Bouchut recommends irrigation, and condemns the mode of applying cold which is recommended above. Says he, "Refrigerants external to the cranium are often employed, and their use appears very rational; still they do not possess a very great efficacy. The application of compresses moistened with cold water, ice in a bladder and laid on the forehead, are bad remedies, which, by causing too considerable alternations of heat and cold, are rather noxious than useful to the child. If it is wished to employ refrigerants, recourse should be had to continual irrigation. The patient is not to be disturbed in its bed; the head should be placed on a cushion, the hair being cut very short; the neck is bound moderately tight by an impermeable stuff, so placed on each side as to form a gutter, so that the water which has been used in the irrigation can run off from each side of the bed without wetting the body of the child. Having arranged these, a jar filled with water of a moderate temperature, 64° Fahr., is placed above the patient; a siphon with a tap is to be placed in the jar, to moderate at will the flow of the liquid. To this tap is fastened a skein of loose thread for the purpose of conducting the water to the forehead, so as to avoid the continuous dropping of the liquid, which would be insupportable." If, however, there is an attentive nurse, who renews the wet cloth sufficiently often, there does not seem to be any danger from reaction, as feared by Bouchut. Irrigation requires as constant attention, in consequence of the restlessness of the child, as does the treatment by a wet cloth, in order that there be no interruption in the employment of it. Few children will remain quiet with a descent of water upon the head, except those who have become entirely insensible, and in such neither a wet cloth nor irrigation affords any material benefit. In simple meningitis in its first stages, the diet should be mild and rather scanty; in the tubercular form it should be more nourishing; beef-tea and milk-porridge are required. In both the simple and tubercular form, at an advanced stage, the most nourishing food is required, but stimulants should not be given unless near the close of life, when the vital powers are failing.

CHAPTER X.

SPURIOUS HYDROCEPHALUS.

THE disease known as spurious hydrocephalus might with more propriety be called spurious meningitis. It received its appellation at the time when meningitis of early life was believed to be essentially a hydrocephalus, and was so called. Attention was first directed to this affection by London physicians of the last generation, particularly Drs. Gooch, Abercrombie, and Marshall Hall, and little can be added to their description of its symptoms.

ANATOMICAL CHARACTERS.—This disease, though resembling meningitis in certain of its phenomena, is not in its nature inflammatory, nor is it primary. It is the result of some affection often chronic, but occasionally acute, which has produced exhaustion, especially of the nervous system. When it commences, there is usually more or less emaciation, and the symptoms of the primary disease are present. To this disease the lesions pertain which are found in other organs besides the brain.

The state of the brain in spurious hydrocephalus is not the same in all cases. In some there is no appreciable anatomical alteration in this organ. There is no apparent difference, either in the meninges or the brain itself, from the condition which we often observe in those who have died of diseases which do not affect the cerebro-spinal system. In such cases the pathological state is simply deficient innervation, or if there is a structural change in the minute anatomy of the brain, pathologists have not yet discovered it.

The following case, which occurred in the Child's Hospital of this city, is an example of this form of spurious hydrocephalus:—

CASE.—A female infant, six months old, died on the 24th day of April, 1862, with the following history: It was wet-nursed, fleshy, and apparently well, till six days before death, when symptoms of gastro-intestinal inflammation were suddenly developed. The vomiting, especially, was severe, continuing forty-eight hours. When it ceased, drowsiness supervened, and continued till the close of life. The face during the four days of stupor was pallid and cool; eyes partly open, pupils sluggish, but of equal size; bowels rather torpid, anterior fontanelle depressed. When aroused, the infant noticed objects for a moment, and immediately relapsed into sleep; pulse accelerated and not intermittent, the day before death numbering one hundred and fifty; respiration accelerated, without sighing, numbering on the same day thirty. There were no convulsions, and death occurred quietly. The brain weighed twenty and a half ounces, and its appearance was perfectly healthy, both as regards consistence and vascularity. The amount of cerebro-spinal fluid in the ventricles and at the base of the brain was not notably increased. The stomach, small and large intestines, were vascular in streaks and patches.

In this case the cerebral symptoms were obviously due to exhaustion occurring at an early period, in consequence of the severity of the gastro-intestinal affection.

In a majority of cases, however, of spurious hydrocephalus, according to my observation, there is an anatomical alteration in the state of the brain and meninges. This consists in passive congestion of the veins, often with transudation of serum. At the same time the cranial sinuses are congested, and are found at the post-mortem examination to contain larger and more numerous clots than are present in those who die of diseases which do not affect the encephalon. Cases might be cited as examples. The cause of this congestion and effusion is, in great measure, feebleness of the circulation due to the general exhaustion of the patient. But there is another cause. In protracted diseases, especially those of a diarrhœal character, there is more or less wasting of the brain as well as of other parts. This naturally, by way of compensation, gives rise to congestion of the cerebral veins and to transudation of serum.

The transudation commonly occurs in this disease over the superior surface of the brain and in the subarachnoidal space, perhaps also more or less in the lateral ventricles. So common is it in the last stage of infantile entero-colitis, the summer epidemic of the cities, that this stage, which is really spurious hydrocephalus, has been called the stage of effusion. I shall relate in another place examples which show the anatomical characters of this intestinal disease.

SYMPTOMS.—Spurious hydrocephalus most frequently results from protracted diarrhœal complaints. It may, however, result from any disease which is attended by great prostration. As it ordinarily occurs, the patient has for days or weeks been gradually losing flesh and strength. Finally drowsiness supervenes, or before the drowsiness there is sometimes a stage of irritability.

Marshall Hall describes two stages of spurious hydrocephalus. In the first, he says, "the infant becomes irritable, restless, and feverish; the face flushed, the surface hot, and the pulse frequent; there is an undue sensitiveness of the nerves of feeling, and the little patient starts on being touched, or from any sudden noise; there are sighing and moaning during sleep, and screaming; the bowels are flatulent and loose, and the evacuations are mucous and disordered." The second stage he describes as that of torpor. The first stage often, however, does not present those prominent symptoms which have been described by Dr. Hall, and this stage may even be absent, or not appreciable, especially in young infants.

Whether or not commencing with the stage of irritability, the disease, if not checked, gradually increases. The child soon becomes drowsy. He may be aroused for a moment, but, unless constantly disturbed, immediately relapses into sleep. He is sometimes fretful when aroused, but in other instances is quite indifferent, observing without apparent interest objects employed for the purpose of amusing him. Often there are indications of cerebral pain or distress, as contraction of the eyebrows, etc., but many of those affected are too young to make known their sensations. Convulsions sometimes occur towards the close of life, but they are not so common in this disease as in meningitis. When they do occur, they are generally partial and often slight. The pulse is accelerated in most patients prior to and in the commencement of spurious hydrocephalus. As the disease advances it becomes irregular and intermittent, and towards the close of life it is progressively more frequent and feeble. The respiration at first is not much disturbed, but at length it becomes irregular, like the pulse. It is feeble and accompanied by sighs. Occasionally there is slight cough. The eyelids are partly open, the pupils no longer respond to light, and in advanced cases they have a bleared appearance. The diarrhœa, which in most instances precedes and causes the disease, continues till the stage of stupor arrives, when the evacuations become less frequent or cease altogether. In infants the stools are frequently green, in older children brown and sometimes slimy. The febrile heat of surface, which preceded the disease and was present in its commencement, disappears; the face and hands become cool, the features pallid, and the anterior fontanelle, if open, is depressed. Death finally occurs in a state of coma, or, if the disease is recognized and proper remedial measures employed, the result may be favorable, even when the symptoms are such that if meningeal inflammation were the disease we would consider the case necessarily fatal.

The following case is an example of spurious meningitis as we often meet it in practice:—

CASE.—On the 13th day of March, 1859, I was asked to see a male child twenty-two months old, the records of whose case are as follows:—

"Was well till about three weeks ago, since which time he has had diarrhœa, with febrile symptoms; pulse 162, respiration 52; has a slight cough, with a few mucous râles; resonance on percussion of chest good; is somewhat emaciated, and appears languid; tongue moist and slightly furred. Has all the incisor and three anterior molar teeth, and the gum is swollen over the remaining anterior molar and two canine teeth."

From the 14th to the 18th there was no material alteration in his symptoms, with the exception that the diarrhœa was partially restrained by Dover's powder in one and a half grain doses. On these five days the dejections numbered daily from one to six. The pulse was uniformly frequent, varying from 124 to 156, and the respiration on two days, when its frequency was ascertained, numbered 56 and 46.

"March 19th, pulse 124; has become drowsy since yesterday, and when aroused is fretful. Omit Dover's powder. Treatment, cold applications to the head, mustard pediluvia.

"Evening, pulse 136; eyes constantly closed and head reclining; surface generally warm; tongue dry and furred; vomited at first, but has not in three or four days. Apply cantharidal collodion behind each ear, and continue the local treatment.

"20th, pulse 130, is constantly sleeping, and when aroused is very fretful and soon relapses into sleep; no unnatural heat of head and no dejection since yesterday. Treatment, a dose of castor oil, nourishing diet.

"21st, drowsiness as before; cheeks sometimes flushed, sometimes pale; pupils sensitive to light; margins of eyelids covered with secretion. The bowels have been opened by the oil."

On the 22d and 23d there was no material change in the symptoms. He was constantly sleeping, except for a moment when shaken. More active stimulation was now employed. Brandy was prescribed, to be given every two hours; beef-tea and milk-porridge frequently.

On the following day, the 24th, he was more fretful, and less drowsy. Brandy and beef-tea were continued.

On the 25th, with the same treatment, there was still further improvement; drowsiness nearly gone and less fretfulness than yesterday; rolls the head occasionally and does not appear to see distinctly; has a slight cough; bowels nearly regular; pulse 100; respiration natural; surface warm, and no unnatural heat of head. The same treatment was continued, and he rapidly and fully recovered.

This case is interesting on account of the long duration of marked drowsiness, which continued five days, and yet the patient recovered fully in the space of two or three days under the use of brandy and beef-tea.

In May, 1860, I was called to treat a very similar case. A child, twenty months old, had diarrhœa for two weeks, the stools being of a dark-brown color, thin and offensive. He was at first very irritable. The pulse was constantly above 130, and the respiration was correspondingly increased. The stage of drowsiness finally supervened, and for two days he was constantly asleep unless aroused by being shaken. During the somnolent stage the pulse numbered 140, respiration 36. The face and extremities were cool and he finally had a slight convulsion. By stimulants and nutritious diet he began immediately to improve, and was soon out of danger.

In the following case the result was unfavorable. This case is interesting on account of the anatomical characters of the disease as disclosed by the post-mortem examination. It is an example of that large class of cases in which spurious hydrocephalus is associated with congestion of the cerebral vessels and serous effusion. It is exceptional, however, as regards the long duration of drowsiness. Ordinarily, protracted diarrhœal maladies which end in congestion and effusion, terminate fatally in two or three days after the drowsy period arrives.

CASE.—"13th, 1861, called to-day to a German infant eighteen months old. It has had diarrhœa four weeks without regular and proper medical attendance; stools from the first brown and thin; during the last eight or nine days has been drowsy; when aroused, opens his eyes and is very fretful, but immediately the upper eyelids gradually droop, and, unless disturbed, he remains asleep with his eyes partially open; forehead warm, face cool and pallid, and limbs also rather cool; pulse 164, respiration 32; has had a slight cough about one week, and slight dulness on percussion over the left infra-scapular region; depression of infra-mammary region on inspiration. Treatment: Ammon. carbonat. gr. 1 every two hours; nourishing diet.

"Dec. 20th, has continued drowsy since the last record; pupils moderately dilated; a thick secretion between eyelids; right pupil considerably larger than the left; vision apparently lost during the three last days; pulse over 140; respiration 44 per minute, accompanied by sighing since the 18th; moans much when awake; rolls the head frequently; during the last six days the surface back of the ears has been constantly sore by vesication; takes the most nutritious diet, with brandy. The dejections remain thin and brown, and number three or four daily.

"From this date the diarrhœa continued, except as it was restrained by vegetable astringents. The pulse continued frequent, and a slight cough remained. There was on the 21st and 22d partial abatement of the drowsiness, but on the 23d it was greater than ever. The body was somewhat reduced at the commencement of the cerebral symptoms, but it was now considerably emaciated. The prostration increased daily, and the hands were observed to tremble. The face and hands became more cold, while the head was warm. On the 24th partial convulsions occurred, followed by coma and death.

"The cerebral veins and sinuses were generally congested, except in the anterior portion of the brain, where the appearance was normal. Between the brain and its membranous covering, chiefly at the vertex and the base, was an effusion of clear serum. The whole amount of this fluid was estimated at two ounces. On slicing the brain, the puncta were numerous and large, both in the gray and white portions. With the exception of the congestion, the substance of the brain presented the normal appearance. No inflammatory lesions were present. We were not permitted to examine the condition of the intestines."

DIAGNOSIS.—The only disease with which spurious hydrocephalus is liable to be confounded is meningitis. The points of differential diagnosis are the history of the case, especially the antecedent diarrhœa or other exhausting ailment, evidence of prostration when the cerebral affection commenced, the depression of the anterior fontanelle in young children, and the cool face and extremities.

PROGNOSIS.—If the pathological state of the brain is simple exhaustion, the disease can often be arrested by judicious treatment. If an incorrect diagnosis be made, and the treatment employed is that appropriate for meningitis, the disease which it simulates, death is almost inevitable. If transudation of serum has occurred, unless slight, the result is apt to be unfavorable, whatever may be the treatment. This disease in childhood is more easily managed than in infancy, but is less frequent. The prognosis is better in the cool months than during the heat of summer. It is more favorable if the child is over than if under the age of one year. The occurrence of an irregular and intermittent pulse, of respiration accompanied by sighs, of inequality in the pupils or their sluggish movements, with increasing stupor, indicates an unfavorable issue. The cure of the primary disease, with the pulse and respiration still natural, or accelerated, without change of rhythm, pupils sensitive to light, drowsiness from which the patient is easily aroused to a state of entire consciousness, render recovery probable, with proper medication and alimentation.

TREATMENT.—The indications of treatment are twofold: first, to remove the primary pathological state which is the cause of the cerebral affection; and, secondly, to cure that affection. The first is important, since the successful treatment of a disease requires the removal of the cause. The measures employed for this purpose are pointed out in our description of the diarrhœal and other maladies which produce spurious hydrocephalus.

We may here say that as this disease is due in a very large proportion of cases to the exhausting effect of long-continued looseness of the bowels, astringents and alkalies are required in a majority of cases in the stage of irritability, and sometimes also opiates.

Active sustaining measures are indicated. Exhausted nervous power, as well as passive cerebral congestion, requires this. The diet should be highly nutritious, comprising such substances as milk and animal broths, and should be given frequently. Brandy is required at short intervals. Dr. Gooch was in the habit of giving the aromatic spirits of ammonia, properly diluted, as a quick and active stimulant. Six or eight drops may be given in sweetened water to a child one year old, and repeated every hour in cases of urgency. If, by proper treatment of the cause, and by the use of stimulants and nutritious food, the patient does not within a few hours become less stupid and more conscious, there is that degree of nervous exhaustion or of serous transudation from the engorged cerebral veins which will render death inevitable. In some cases it is proper to produce moderate vesication behind the ears.

CHAPTER XI.

ECLAMPSIA.

THE term eclampsia is used in a more restricted sense by some writers than by others. It is used in the following pages to designate those convulsive seizures, clonic in their character, sometimes general, sometimes partial, which affect the external muscles. Eclampsia is therefore synonymous with clonic convulsions. It consists in a rapid, forcible, and involuntary muscular contraction, alternating with relaxation. It is distinguished from chorea in the fact that the latter is a more permanent state, and is characterized by muscular movements which are partially under the control of the will, and are not so violent.

Eclampsia occurs in a great variety of diseases, some of which are located in the cerebro-spinal system, some in other parts of the body, and some are constitutional. It may also be produced by temporary derangements of system, not sufficiently severe to be considered disease, and by powerful mental impressions, those of an emotional nature affecting the delicate and sensitive nervous system of the child. Pathologists recognize three distinct forms of eclampsia. The term essential or idiopathic is used when the convulsions have no appreciable anatomical character, that is, when there is no apparent pathological state in the brain or elsewhere which gives rise to the attack. For example, if a child dies in convulsions from fright, and all the organs, including the brain, are found in their normal state, the eclampsia is called idiopathic or essential. If the cause is disease of the brain or spinal cord, it is termed symptomatic. If it arises from disease elsewhere, as from pneumonia, the term sympathetic is employed. This is in the main a good division, but eclampsia may be at the same time sympathetic and symptomatic, as when it occurs in consequence of congestion of brain, which is induced by severe and frequent paroxysms of hooping-cough.

Causes.—Eclampsia occurs at any period of infancy and childhood, but it is much more rare after the period of six or seven years than previously. Some children are more liable to it than others. It is produced in one by an agency which in another has no appreciable effect. There are some, generally those of an impressible nervous system, who are seized with convulsions whenever there is any slight derangement in the digestive or other organs. Eclampsia is frequent in certain families. Thus, Bouchut mentions a family of ten persons, all of whom had convulsions in their infancy. One of them married, and had ten children, all which, with one exception, had convulsions.

The exciting causes of eclampsia are too numerous to be mentioned in full. It is a symptom in nearly all cerebral diseases. It is produced in the nursling by changes in the milk with which it is nourished. These changes are usually due to violent emotions of the mother, as anger, fright, and grief, to the use of acescent or indigestible food, or to derangement, temporary or permanent, in her health. Thus, in a case related to me, the catamenia so affected the milk that the child was seized with eclampsia at each monthly period. In childhood the most common cause of clonic convulsions is the presence of some irritant in the primæ viæ. All kinds of fruit, even the mildest, may produce the disease, especially when eaten unripe or taken in undue quantity. I have known an infant to be seized with convulsions from eating strawberries, which parents usually regard as harmless, and one of the most violent and protracted cases of eclampsia which I have witnessed, occurred in a child over the age of six years, from swallowing, in considerable quantity, the parenchymatous portion of an orange. Constipation, worms, dysentery, intussusception, and painful dentition are also causes which are located in the digestive apparatus. Inflammation in some part of the respiratory apparatus is a not infrequent cause. Thus eclampsia occurs occasionally in severe coryza, in consequence, according to some, of the proximity of the inflamed surface to the brain, and the consequent afflux of blood to this organ. It is a common complication also of pertussis and pneumonia. It occurs often at the commencement of two of the eruptive fevers, namely, smallpox and scarlet fever, and in the course of the latter disease.

Violent emotions of the child may also cause eclampsia. Bouchut relates the case of a girl, five years old, who was corrected before her companions, and was so affected by anger that convulsions occurred. Residence in close and overheated apartments, or in streets where the air is loaded with offensive vapors and is stifling, is a predisposing cause, so that there is a larger proportion of deaths from convulsions in the cities than in the country.

In young children, burns, even when not very severe, are apt to terminate suddenly in eclampsia, succeeded by coma and death. Urinary calculi, both renal and vesical, frequently produce the same result.

Such are the more common causes of eclampsia. It is seen that they are of two kinds, predisposing and exciting. An excitable or impressible state of the nervous system constitutes the chief predisposition to the disease. Plethora, or its opposite state, anæmia, increases the liability to an attack.

PREMONITORY STAGE.—In the majority of cases there are prodromic symptoms, which the experienced and careful physician can detect, so as to forewarn friends. The child is perhaps more or less drowsy, and, when disturbed, fretful. The eyes often have a wild or unnatural appearance; occasionally they are fixed for a moment on an object, and yet apparently without noticing it. The sleep is disturbed; in some there is unusual heat of head, and, if old enough, complaint of headache. At times, especially if the primary disease is febrile or inflammatory, there is incoherence of thought or expression, or even actual delirium. In some children, when eclampsia is threatening, the thumbs are seen to be carried often across the palms. I have observed this especially during the convulsive cough of pertussis. A very important prognostic symptom is a sudden starting, or twitching of the limbs. This shows that the nervous system is profoundly impressed, and but slight additional excitation is required to develop eclampsia. This sudden starting not infrequently precedes the attack several hours, and gives sufficient forewarning.

The prodromic symptoms are often disregarded by friends who do not understand their significance. Even physicians, in the haste of their visits, in many instances do not notice them. The symptoms which precede symptomatic and sympathetic eclampsia are, moreover, blended with those of the primary affection, and hence another reason why they are apt to be overlooked. When the convulsions are about to commence, the child generally lies quiet; the eyes are open and fixed. If spoken to or shaken, he takes no notice, and does not speak. The direction of the eyes is then changed; often they are turned up; sometimes there is strabismus. The face may be pale or flushed, and often, especially in cerebral diseases, the features present patches or streaks of a flushed appearance, while around them the natural color is preserved. Immediately before the spasmodic movements the child occasionally utters a piercing scream, which is probably involuntary, though it seems like a supplication for help. The duration of the prodromic stage is very different in different cases. It may last from a few minutes to several hours, or even more than a day.

SYMPTOMS.—Eclampsia is general or partial. If *general*, the muscles of the face, eyes, eyelids, and of all the limbs, are in a state of rapid involuntary contraction, alternating with relaxation. The features lose their natural expression, and are distorted; the mouth is drawn out of shape, often to one side, by the violent muscular action; the teeth are pressed together by tonic contraction of the masseters, and may be violently struck together, so as to lacerate the tongue, if it protrude, or are ground upon each other. Unless the attack is of short duration, frothy saliva, perhaps tinged with blood from the injured tongue, collects between the lips. The eyelids are usually open, and in severe cases the eyes are turned so that the pupils are lost under the upper eyelids, or the muscles of the eyes are involved in the spasmodic movements, so that the eyeballs are forcibly drawn from side to side. Occasionally, strabismus occurs. While the features are thus distorted, the head is forcibly retracted, or is turned to one side; the forearms are alternately pronated and supinated; the thumbs and fingers are convulsively flexed, so that the thumbs lie across the palms, and are covered by the fingers; the great toe is adducted, the other toes flexed; and the toes, as well as legs, participate more or less in the spasmodic movements.

In general convulsions, consciousness is usually lost. The head is hot previously to and during the attack—at least in the first part of it—and the face flushed. In exceptional cases, especially in sympathetic eclampsia, the head is cool and the face pale. The pulse is somewhat accelerated, as well as the respiration, and the latter is rendered irregular if the respiratory muscles, especially those of the larynx, are involved, as they generally are. The sphincters are relaxed during the convulsive attack, so that in many cases the urine and stools are passed involuntarily.

PARTIAL eclampsia is more common than the general form; it occurs in the muscles of the face, including those of the eye, of the face, and of one or both upper extremities, or of the face and the extremities on one side. The spasmodic movements may be even limited to the muscles of the eyes, and they often occur only in these muscles and those of the face. Rarely, if ever, does eclampsia affect the legs without affecting also the muscles of the arms and face. In partial convulsive attacks, sensation and consciousness are in some not entirely lost, but in others they are not manifested if present.

The duration of an attack of eclampsia varies in different cases from a few minutes to several hours. The average is not more than from five to fifteen minutes. It does not often continue longer than three or four hours in the severest cases. It is sometimes said to last a much longer time, even for days, but there are in these cases intermissions. Violent attacks are usually short.

When the convulsion ends favorably, the spasmodic movements become less and less strong, and finally cease. The child then takes a deep inspiration, after which it lies quiet, and the respiration remains regular or moderately accelerated. Some fully recover in a few minutes if the eclampsia has been light and the cause transient, and seem to experience no inconvenience except soreness of the muscles and fatigue. Others soon recover consciousness, and their temperature, respiration, and circulation become natural, but they remain dull for a time, their minds are bewildered, and they are perhaps unable to speak. In a few hours these untoward symptoms pass away. In essential, and in a large proportion of cases of sympathetic eclampsia, if properly treated, and if the cause is recognized and removed, there is no recurrence of the convulsion; with others it is different. In many cases, especially of symptomatic eclampsia and of sympathetic, in which the cause is grave and persistent, the convulsions return after a variable period of a few minutes or a few hours. Six or eight or more convulsions may occur within twenty-four hours. Rarely they occur several times daily for several consecutive days, but severe convulsions, repeated at short intervals for twenty-four or forty-eight hours, usually end in fatal congestion of the brain or serous effusion. I once attended an infant about six months old, who had from four to twelve convulsions daily for eleven days, caused probably by a vesical calculus, as there was dysuria, and, at times, bloody urine. Some days after the convulsions were controlled, while we were deferring exploration of the bladder, death occurred suddenly, and the autopsy was not permitted. This case will be detailed elsewhere. Bouchut has witnessed a case of hooping-cough in which there were daily convulsions for eighteen days.

In severe eclampsia, the respiration is so embarrassed and circulation so retarded that congestion of various organs results. This passive congestion in the respiratory organs is indicated by moist râles in the larynx and bronchial tubes; occurring in the brain, it is indicated by profound stupor. It has already been stated that death may occur from the cerebral congestion, which, continuing, is apt to end in effusion of serum or extravasation of blood. In these cases the convulsive movements cease, but there is no return of consciousness. The child lies quiet, as if in sleep, with pupils not readily acted upon by light, and often somewhat dilated; gradually the limbs grow cool and the pulse feeble, and fatal coma supervenes.

Death does not ordinarily occur from one attack. There are several at intervals, during which the stupor is gradually becoming more and more profound, till, finally, there is total loss of consciousness and sensation. This is the most frequent mode of death, namely, death from coma. Apnœa may occur in the first attack, ending life abruptly and unexpectedly, but in other instances it does not result till after several seizures, when, at length, one more violent than the others interrupts the respiratory function and causes death.

Occasionally, when life is preserved, there is some permanent ill effect of eclampsia. Bouchut says: "The origin of certain permanent contractions which bring on deviation of the head or of other parts, retraction of the limbs, paralysis, etc., must be referred to the convulsions of the muscles. I have seen several children in whom torticollis had no other cause. The drooping of the upper eyelid, strabismus, irregularity of the mouth, severe contractions of the limbs, often depend on this influence. These accidents are consequences of essential as well as of symptomatic convulsions."

ANATOMICAL CHARACTERS.—The morbid anatomy pertaining to eclampsia is in most cases twofold: first, the pathological states which precede and cause the convulsive movements; secondly, those which result from them. We have seen that in sympathetic eclampsia the diseases which sustain a causative relation are very numerous; some are constitutional, others local, and the latter may have their seat in almost any part of the economy, distinct from the cerebro-spinal axis. In some cases of sympathetic eclampsia the immediate cause is too active a circulation, a state of hyperæmia of the cerebral vessels.

It has already been stated that this hyperæmia may be diagnosticated in young infants in whom the anterior fontanelle is open. Such infants, seized with acute inflammation of the mucous surfaces or of the lungs, often present a full and rapid pulse and a convex and forcibly pulsating fontanelle before the eclampsia begins. In other cases of sympathetic eclampsia the primary disease induces passive congestion of the brain, and this in turn gives rise to convulsions. Eclampsia occurring during the paroxysms of hooping-cough affords an example. In the contagious diseases, as smallpox and scarlet fever, eclampsia is doubtless often produced by the direct action of the specific virus on the cerebro-spinal system. Therefore, in a considerable proportion of cases of eclampsia due to diseases not located in the cerebro-spinal system—in other words, of sympathetic eclampsia—the primary disease induces a pathological state of the cerebral vessels or of the blood which circulates through them, which state immediately precedes and accompanies the convulsions.

In other cases of sympathetic eclampsia the convulsive movements are produced by the primary disease, acting directly on the nervous system, through the medium of the nerves, without causing any appreciable alteration in the state of the cerebro-spinal axis. Thus Barrier relates three fatal cases of convulsions occurring in pneumonia, in none of which was there anything abnormal in the condition of the brain or its membranes.

The pathological state preceding SYMPTOMATIC eclampsia differs in different cases, since convulsions occur in almost every disease of the brain and its membranes. The immediate cause of this form of eclampsia may be active or passive cerebral congestion, with or without effusion; it may be compression of the brain from various causes; it may be a deficiency as well as excess of the cerebrospinal fluid.

In essential eclampsia the cause sometimes produces congestion of the brain prior to the convulsive seizure. In other cases, as when convulsions occur immediately from the effect of anger or fright, there is no appreciable change in the state of the nervous centres previously to the attack.

Again, eclampsia, especially when severe and protracted, and when occurring in successive attacks, may be the cause of certain lesions. It produces congestion of the brain and membranes, and perhaps of the spinal cord. Sometimes, if the congestion is great, there is also escape of serum from the distended capillaries, and the fibrin in the larger vessels, as the sinuses, may coagulate.

The congestion resulting from eclampsia may give rise to extravasation of blood and the formation of a clot. If this accident occur, there is often paralysis affecting more or less of one side, permanent or gradually disappearing.

It may be difficult to decide whether the cerebral congestion precedes the eclampsia or is its result; but in those cases in which it precedes and operates as a cause, it is no doubt increased during the convulsive period. The spasmodic muscular action, by rendering respiration irregular and imperfect, also leads to congestion of the lungs and sometimes of the abdominal organs.

DIAGNOSIS.—The only disease for which there is danger of mistaking eclampsia is epilepsy. M. Ozanam mentions the following means of distinguishing the two: "Eclampsia differs from epilepsy in the frequent occurrence of prodromic symptoms; the clonic form of the convulsions, the rare appearance of froth in the mouth, the absence of a hideous livid aspect of the countenance, the spasmodic and sobbing character of the respiration, frequency of the pulse, and a state of quiet without snoring which succeeds an attack." In the young child, however, the above points of distinction are not reliable as a means of differential diagnosis. Some patients, who seem to have genuine attacks of eclampsia in infancy and childhood, prove to be epileptic in subsequent years. The usual period of eclampsia is prior to the age of eight years, and if convulsions occur after this age without apparent exciting cause, or from trifling causes, the disease is probably epilepsy; if prior to the age of eight years, and especially of three or four, they are in the vast majority of cases the convulsions of eclampsia.

It is often difficult to ascertain the form of eclampsia, whether essential, symptomatic, or sympathetic—in other words, to determine the cause—till after the convulsions cease. This is especially true when, as is frequently the case, the physician is not summoned till the convulsive movements begin, and it is necessary that he should act promptly, with but little knowledge of the child's previous history. If there is an obvious antecedent disease, as hooping-cough or meningitis, the cause is apparent; but if the previous health has been good, or but slightly disturbed, it may be necessary to make more than one visit or examination in order to ascertain the seat and character of the cause. In the majority of cases of convulsions occurring suddenly in a state of previous good health, the cause is seated in the intestines, but sudden and unexpected attacks may be due to the commencement of some inflammatory affection, as pneumonia, or of a febrile disease, as smallpox. Unless the eclampsia is speedily fatal, the physician, if he examine carefully, will, in most cases, soon be able to ascertain the nature of the cause, and diagnosticate the form of the disease.

PROGNOSIS.—Symptomatic eclampsia is always serious. If convulsions occur in the course of a cerebral disease, it indicates the approach of death, but if at the commencement, some recover. The recurrence of it, whatever the cerebral disease, is an almost certain prognostic of death.

In idiopathic or essential convulsions the prognosis depends on the severity of the attack, and on the age, strength, and previous condition of the child. If there are predisposing or co-operating causes, as a nervous or excitable temperament, or dentition, the prognosis is less favorable than when such causes are absent.

In sympathetic eclampsia the prognosis varies greatly, according to the nature of the primary disease, and often according to the stage of that disease. If convulsions occur at the commencement of an eruptive fever, they generally subside without untoward symptoms, and the fever pursues a favorable course. Eclampsia, after the appearance of the eruption, is premonitory of a fatal result. I have not yet known a patient with scarlet fever recover who had convulsions after the rash had covered the body, and experienced physicians of this city tell me that their observations correspond with mine. Dr. J. F. Meigs, however, relates one favorable case. If the cause of the eclampsia is located in or upon the mucous surfaces, a majority recover with judicious treatment.

In convulsions consequent on pneumonia or a burn, more die than recover.

The prognosis in eclampsia is more favorable if the parallelism of the eyes is retained, the pupils remain sensitive to light, and consciousness soon returns. A fatal termination may be predicted, if, after the convulsion, the child remains stupid, without any evidence of returning consciousness.

TREATMENT.—Fortunately, inasmuch as the physician is often required to treat eclampsia in ignorance of the cause, the same measures are demanded, to a considerable extent, in all cases, whether the form be essential, symptomatic, or sympathetic. As early as possible in the attack the feet should be placed in hot water to which mustard is added, or, if it can be procured with little delay, a general warm bath may be used in place. This has a soothing effect upon the nervous system and promotes muscular relaxation, while it also produces derivation of blood from the cerebro-spinal axis. It is, therefore, useful, especially in those cases in which active or passive congestion precedes the eclampsia; it is also useful as a preventive of passive congestion and consequent œdema of the brain, lungs, and other organs, which are the most serious results of eclampsia. It should be continued from six to fifteen or twenty minutes, according to the severity and duration of the attack; at the same time cold applications should be made to the head, until its temperature, which is usually increased, is reduced. The application of a cloth, frequently wrung out of cold water, is the most convenient and ready mode of employing this agent. Cold thus employed acts promptly in contracting the vessels of the brain and meninges, and diminishing the cerebral congestion. It tends, therefore, to remove one of the chief dangers.

As a large proportion of convulsive attacks originate in the condition of the bowels, either solely or in part, it is advisable, unless there is a previous diarrhœal affection, to prescribe an aperient.

The common enema of soap and water will usually produce a free and speedy evacuation, and will sometimes disclose the cause of the eclampsia in the expulsion of seeds, or other indigestible substances or scybala. A cathartic is also often required, especially if the enema fail to produce sufficient evacuations. In those that are robust, and especially in those beyond the age of two or three years, calomel is an excellent purgative, is easily given, and is prompt in its action. If the symptoms indicate intestinal inflammation, the milder purgatives, as castor oil, are preferable, as they also are in young or feeble children. If the recent ingesta of the patient consisted of fruit or of substances of an indigestible character, an emetic is appropriate; a teaspoonful of the syrup of ipecacuanha, repeated if necessary in fifteen or twenty minutes, may be given to a young child, or this syrup in combination with hive syrup to one older and more robust. Aside from the ejection of the offending substance which it produces, an emetic has some effect in controlling the convulsive movements.

Convulsions sometimes cease, apparently, in consequence of the muscular relaxation caused by the emetic. By such measures, or even without them, the attack usually terminates in a short time; but if it continue, and there is considerable heat of head or other indication of active congestion of this organ, we may try compression of the carotids by the fingers, as recommended by Trousseau. This distinguished observer believed that he succeeded in diminishing the afflux of blood to the brain, and thereby shortening eclampsia, by this simple expedient. Brown-Séquard (Remarks before the United States Medical Association, 1866) has stated that this result is due, not so much to compression of the carotid, as to pressure on the cervical portion of the sympathetic nerve, which (pressure) causes contraction of the cerebral vessels.

If the convulsions do not cease by the employment of the measures recommended above, one or two leeches may be applied to the temples if the child is robust, and there is increased heat of face or head. The abstraction of blood directly from the head has the obvious effect of diminishing cerebral congestion, and has been the means of shortening the attack and saving life. Antispasmodics have been used for a long period in cases of eclampsia, and they are recommended in our standard works. I have never observed any benefit from the use in clonic convulsions of either assafœtida or valerian; though I have occasionally ordered the use of such agents both by the mouth and by enema. Chloroform, whether inhaled or swallowed, does control the convulsive movements. In protracted or frequently recurring eclampsia, especially when it is due to a highly sensitive nervous temperament, and there is probably little or no cerebral congestion, this is one of the most reliable agents employed by inhalation, and it is not unsafe if cautiously used by the physician himself. It should be employed only in the convulsion, and withheld the moment the spasmodic movements cease. In symptomatic eclampsia, or in the other forms, if there are indications of cerebral congestion, I would not recommend its use. Dr. A. P. Merrill

(*Amer. Journ. of Med. Sci.*, Oct. 1865) gives chloroform by the mouth in the treatment of this disease, and in doses which most practitioners would hesitate to prescribe. He has given even a teaspoonful at a dose, to a child a few years old, with satisfactory result. In most of those cases, however, in which chloroform is useful, the hydrate of chloral promises to be a safer and efficient substitute, and it is more easily administered. I have already spoken of the employment of chloral in the convulsions of meningitis.

The propriety of prescribing opium in any form of convulsive attacks in children is doubted by many on account of the drowsiness which it produces. There can be no doubt, however, of the propriety and the good effect of its use in certain cases of essential and of sympathetic eclampsia. I refer to those cases in which attacks of eclampsia occur with intervals during which there is no stupor, and the patient preserves consciousness. Opiates may occasionally be of service in other cases, but in such they are especially indicated. Thus, recently, in my practice, an infant six weeks old, in whom there was an hereditary predisposition to eclampsia, was taken with diarrhœa, and soon after with convulsions. The attack was short, but after a brief interval it returned, and during the subsequent twelve hours there were about twenty convulsions. There was no unusual heat of head or prominence of the anterior fontanelle, or other evidence of cerebral congestion. The green and unhealthy appearance of the stools showed that the cause was located in the intestines. After trial of various remedies, among which were antispasmodics, these convulsive seizures were soon relieved by the use of paregoric in doses of five drops, which also had a salutary effect on the cause of the eclampsia, and in a few days there was complete restoration to health.

In recent times the attention of the profession has been directed to the bromide of potassium as a remedy in convulsive disorders. It is ordinarily prescribed alone, in powder or solution. I can speak favorably of its use in obstinate cases, not only in children approaching the age of puberty, but in infants, especially when the cause is obscure or beyond our reach. It produces a decided impression on the nervous system, so as to diminish the liability to spasmodic affections. In the following interesting case, already alluded to, this agent was employed with the effect of relieving entirely the convulsive seizures, although the cause continued. On the 29th of January, 1866, I was asked to see an infant six months old, who, during the preceding week, had had an average of eight convulsions daily; each convulsion lasted about eight or ten minutes, and was general; the child was nursing, and had no teeth, and no decided swelling of the gums. A careful examination could detect no cause, though the infant was fretful and seemingly in considerable pain. Some days subsequently it was observed to pass, with apparent pain, urine in less quantity than when in health, and occasionally tinged with blood. The cause of the eclampsia was therefore probably a vesical calculus. Various remedies were made use of till February 1st, without diminution in the severity or frequency of the attacks; when bromide of potassium was prescribed in half-grain doses every six hours. From February 1st to 3d there were two convulsions daily. On the 3d the medicine was given every three hours, after which there was no further eclampsia. The medicine was discontinued on the 7th. The infant nursed as usual, and its health seemed to be re-established, with the exception of those symptoms which indicated the presence of a calculus. Examination of the bladder for stone was deferred for a few days, when, about two weeks subsequently to the last convulsion, the infant died suddenly and unexpectedly. Though the result of this case was unfavorable, the controlling power of the bromide over the eclampsia was apparent.

Those children who are subject to eclampsia from trifling causes, and sometimes without apparent cause, while their general health is good, are more benefited by bromide of potassium than by any other medicine. The efficacy of the bromide in epilepsy is well known, and in all those cases of eclampsia which approximate epilepsy, and in which it is feared that the child will become epileptic, this agent is preferable to all others. It may be given in doses of one grain to a child one year old, every three to six hours, and an additional half grain or grain for every subsequent year.

℞. Potass. bromid. gr. xvj;
Sacch. alb. ʒss;
Aq. anisi ℥ij.
Dose, one teaspoonful every three to six hours, to a child of one year.

The treatment of eclampsia obviously should vary in different cases, according to the cause. If it occur in an eruptive fever, as scarlatina, and the eruption has receded, active revulsive measures, as hot mustard-baths, are required; if in dysentery, or other internal inflammation, sinapisms should be applied over the affected part; if the gums are swollen, and the eclampsia is not readily controlled by the ordinary measures, they should be scarified. In those dangerous cases in which symptoms of cerebral congestion continue after the eclampsia ceases, additional treatment is required. The child remains drowsy, does not speak, or apparently suffer in any way, and the pupils act less readily than in health. If this condition remains after the lapse of a few hours, there is probably serous effusion. All attacks of eclampsia, unless the mildest, are followed by a period of drowsiness, but the persistence of it, with symptoms which indicate hyperæmia, with perhaps effusion within the cranium, calls for the employment of additional measures. Vesication should then be produced behind the ears, mild revulsives be applied to the extremities, the head kept cool, the bowels open, and, in certain cases, a diuretic like iodide of potassium may be advantageously employed. The utmost care should be enjoined in reference to the hygienic management of those who are subject to eclampsia. The diet should be nutritious, but bland, and all causes of excitement be studiously avoided.

CHAPTER XII.

TETANUS INFANTIUM.

Tetanus or trismus is one of the most interesting diseases of infancy. It is first, in point of time, in the long catalogue of fatal maladies. It occurs suddenly and unexpectedly in the robust as well as feeble, almost certainly destroying life within a few hours under modes of treatment heretofore employed. It is more frequent in some localities and conditions of life than in others. In New York it is more common than tetanus at any other age, or, indeed, in all other ages, since the mortuary statistics of this city exhibit a larger number of deaths from this disease in the first year of life than subsequently. Infantile tetanus occurs, with very few exceptions, in the new-born.

Interesting and important as is tetanus infantium, it must be confessed that our knowledge of it is much more limited and imperfect than it should be, when we consider what great advancement has been made in pathological inquiries during the present century. Our information in reference to its causation, symptoms, and proper treatment is not much in advance of that of M. Dazille, or Dr. Joseph Clarke, who lived in the latter part of the last century.

Did we better understand the pathology of diseases in the new born, or could we more accurately ascertain the condition organs at this age, doubtless we should occasionally consider those phenomena which we now designate as a disease *per se*, under the title tetanus, as symptoms of some other affection. But as tetanic rigidity and spasms in the new-born occur so abruptly, masking all other symptoms, and ordinarily ending in death without our knowing certainly whether or not there is any antecedent disease, it seems eminently proper that we should recognize the state in which such muscular rigidity occurs with such a rapid result as an independent affection. This explanation is required from the fact that I have added to the accompanying table one case from Billard, which this observer relates under the head of spinal meningitis. In this case, an infant three days old was attacked with convulsions. "His limbs were rigid and violently bent; the muscles of the face were in a continual state of contraction." On the following day "the convulsions continued; . . . the body remained rigid, and the vertebral column, which the weight of the trunk will cause to bend with the greatest ease in a young infant, remained straight and immovable whenever the child was raised." At the autopsy, in addition to meningeal apoplexy, which is often present in those who die of tetanus infantium a thick pellicular exudation was found upon the spinal arachnoid. There is, therefore, a strict accordance of the symptoms and history of this case with those which other observers describe as examples of tetanus infantium; moreover, as a satisfactory reason for including this case in our statistics, certain eminent observers, as we will see, have reported epidemics of tetanus in which meningitis was the principal lesion.

FATAL CASES.

Case 1. Male; taken when three days old; lived sixty hours. Labatt, *Edin. Med. and Surg. Journ.*, April, 1819.
" 2. Female; taken when three days old; lived forty hours. *Ibid.*
" 3. Taken when five days old; lived fifty hours. *Ibid.*
" 4. Taken when three days old; lived one day. *Ibid.*
" 5. Male; taken when two days old; lived two days. Billard, *Treatise on Diseases of Children*, Stewart's trans., p. 477.
" 6. Male; taken when three days old; lived two days. Romberg.
" 7. Male; taken when six days old; lived ninety-three hours. Dr. Imlach, *Month. Journ. of Med. Sci.*, Aug. 1850.
" 8. Female; taken at five days; lived four days. Caleb Woodworth, M.D., *Boston Med. and Surg. Journ.*, Dec. 13, 1831.
" 9. Negro; taken at seven days; lived twenty-four hours. P. C. Gaillard, M.D., *South. Journ. of Med. and Phar.*, Sept. 1846.
" 10. Male; taken when seven days old; lived one day. Augustus Eberle, M.D., *Missouri Med. and Surg. Journ.*, 1847.

Case 11. Taken when seven days old. D. B. Nailer, *N. O. Med. Journ.*, Nov. 1846.

" 12. Male; taken when three days old; lived one day. *N. O. Med. and Surg. Journ.*, May, 1853.

" 13. Negro; taken when three days old; lived three days. Robert H. Chinn, M.D., *N. O. Med. and Surg. Journ.*

" 14. Taken when two days old; died in four hours after the doctor's visit. *Ibid.*

" 15. Taken when seven days old; lived one day. C. H. Cleaveland, *New Jersey Med. Rep.*, April, 1852.

" 16. Negro; taken when seven days old; death finally. Greenville Dowell, *Amer. Journ. of Med. Sci.*, Jan. 1863.

" 17. Taken when twelve days old; lived one day. Thomas C. Boswell communicated to Dr. Sims, *Amer. Journ. of Med. Sci.*, 1846.

" 18. Taken when about five days old; died at about the age of nine days. B. R. Jones. *Ibid.*

" 19. Taken at or soon after birth; lived two days. Dr. Sims, *Amer. Journ. of Med. Sci.*, April, 1846.

" 20. Taken at the age of six days; lived one day. *Ibid.*

" 21. Taken when three days old; lived two days. *Ibid.*

" 22. Male; taken at the age of eight days; died in three hours. Communicated to the writer.

" 23. Taken at the age of twelve hours; lived two days. Communicated to the writer.

" 24. Female; taken when seven days old; lived forty-five hours. The writer.

" 25. Male; taken at the age of seven days; lived about forty-eight hours. *Ibid.*

" 26. Female; taken at the age of eight days; lived three days. *Ibid.*

" 27. Female; taken at the age of five days; lived three days. *Ibid.*

" 28. Female; taken when four days old; lived two days. *Ibid.*

" 29. Taken when six days old; died next day. *Ibid.*

" 30. Taken when five days old; lived twenty-four hours. *Ibid.*

" 31. Taken when eight days old; lived two days. *Ibid.*

" 32. Male; taken when five days old; lived one day. *Ibid.*

FAVORABLE CASES.

Case 1. Negro; female; taken when three days old; recovered in a few days. Robert S. Baily, *Charleston Med. Journ. and Rev.*, Nov. 1848.

" 2. Negro; taken at eleven days; recovered in fifteen days. W. B. Lindsay, *N. O. Med. Journ.*, Sept. 1846.

" 3. Negro; taken when ten days old; recovered in thirty-one days. P. C. Gaillard, *Charleston Med. Journ. and Rev.*, Nov. 1853.

" 4. Male; taken at the age of eight days; recovered in twenty-eight days. *Ibid.*

" 5. Negro; taken at seven days; recovered in fifteen days. Augustus Eberle, *Missouri Med. and Surg. Journ.*, 1847.

" 6. Taken when eight days old; recovered in four weeks; Furlong, *Edin. Med. and Surg. Journ.*, Jan. 1830.

Case 7. Taken at the age of one week; recovered in two days. Dr. Sims, *Amer. Journ. of Med. Sci.*, April, 1846.
" 8. Female; taken at the age of three days; recovered in five weeks. The writer.

PERIOD OF COMMENCEMENT.—Finckh, who saw cases of tetanus of the new-born in the Stuttgart Hospital, states (*Hecker's Annalen*, vol. iii. No. 3, p. 304) that it began in one case on the second day after birth, in eight on the fifth, and in seven on the seventh.

Professor Cederschjold, of Stockholm, treated forty-two cases in hospital practice in 1834, and in these cases it usually commenced between the ages of four and six days. Copland says (*Medical Dictionary*) that it generally commences in the first seven or nine days after birth, and rarely later than the fourteenth. Romberg states that it commences between the fifth and ninth days. In two hundred cases observed by Reicke, in Stuttgart, in the course of forty-two years, it was never found to commence before the fifth, rarely after the ninth, and never after the eleventh day. Schneider says that the disease occurs oftenest between the second and seventh, and rarely after the ninth day. In six cases reported by Dr. C. Levy, of Copenhagen, it began in two on the third day, in two on the fifth, and in two on the sixth. Dr. Greenville Dowell (*Amer. Journ. of Med. Sci.*, Jan. 1863), who has seen much of tetanus infantum among the negroes in Mississippi and Texas, says it is almost sure to come on between the fifth and twelfth days after birth. In the forty cases embraced in the above table, the disease began as follows:—

Age.	Cases.	Age.	Cases.
One day or under	2	Seven days	8
Two days	1	Eight "	6
Three "	9	Ten "	1
Four "	2	Eleven "	1
Five "	6	Twelve "	1
Six "	3		

Very rarely, as will be seen hereafter, tetanus begins at or soon after birth, that it may be properly called congenital.

FREQUENCY IN CERTAIN LOCALITIES.—Tetanus infantum occurs probably in all countries, but it does not greatly increase the mortality except in certain localities. Some of the British and continental physicians whose observations of disease have been ample, confess that they have seen so few cases that they have almost no personal knowledge of this affection. On the other hand, there are, or have been, places in every zone where it is or has been so prevalent as to sensibly check the increase of population. The attention of the profession, more than half a century since, was directed to the prevalence of tetanus in the Island of Heimacy, off the coast of Iceland. On this island scarcely an infant escaped, while on the mainland scarcely one was affected. Heimacy, the product of volcanic action, of small extent and almost destitute of vegetation, supports a scanty population. The inhabitants live chiefly on the flesh and eggs of the sea-fowl, and are filthy and degraded in their habits. About the year 1810, the Danish government deputed the *landphysicus* of Iceland to visit Heimacy, and ascertain the nature of the disease which was so destructive to the infants. Although this gentleman, from his brief stay, saw no case himself, he obtained interesting particulars in reference to the disease from the priests and parents. At this time scarcely an infant escaped. Again, according to Dr. Schleisner, whose report in reference to the same locality was published forty years later, this disease was still the most fatal of all infantile affections.

Tetanus infantum is also represented as very fatal in the Island of St. Kilda, off the coast of Scotland. In the temperate regions of America and Europe cases are not frequent, except occasionally in the poor quarters of the cities, in foundling hospitals, and rarely in country towns where the conditions are favorable for its occurrence. The records of the Dublin, Stuttgart, and Stockholm lying-in asylums furnish many cases. In the town of Fulda, Germany, in 1802, Dr. Schneider saw six cases in fourteen days, while a midwife in the same place stated that she had seen more than sixty in nine years.

But the greatest mortality from tetanus infantum is in the warm climates, both of the Eastern and Western Hemispheres. In the West Indies, the southern portion of the United States, the equatorial regions of South America, and in the islands of Minorca and Bourbon, it has, in many localities, been the most frequent and fatal of infantile maladies.

It is an interesting fact that in the warm regions of the United States the victims are chiefly negro infants. L. S. Grier, M.D., of Mississippi, says, in the *N. O. Med. and Surg. Journ.*, May, 1854: "The first form of disease which assails the negro among us is trismus. The mortality from this disease alone is very great. No statistical record, we suppose, has even been attempted, but from our individual experience we are almost willing to affirm that it decimates the African race upon our plantations within the first week of independent existence. We have known more than one instance in which, of the births for one year, one-half became the victims of this disease, and that, too, in spite of the utmost watchfulness and care on the part of both planter and physician. Other places are more fortunate, but all suffer more or less; and the planter who escapes a year without having to record a case of trismus nascentium may congratulate himself on being more favored than his neighbors, and prepare himself for his own allotment, which is surely and speedily to arrive." Dr. Wooten (*N. O. Med. and Surg. Journ.*, May, 1846) says: "It is a disease of fatal frequency on the cotton plantations in this section of Alabama." He has, however, never seen a white child affected with it.

In New Orleans, according to the death statistics in our possession, which, however, relate to only one year, tetanus infantum is the most fatal of all diseases except phthisis. Mr. Maxwell says, in the *Jamaica Physical Journal* (copied in the *London Lancet*, April 11th, 1835): "From observations that I have made for a series of years, . . . I found that the depopulating influence of trismus neonatorum was not less than twenty-five per cent. It scarcely has a parallel within the bills of mortality." This gentleman's observations relate to the West Indies. Similar statements are made in reference to this disease as it occurs in Cayenne and Demerara in South America.

While tetanus infantum prevails in regions wide apart, and presenting very diverse climatic conditions, there is a similarity as regards the personal and domiciliary habits of the people who suffer most from its occurrence. It occurs chiefly among those who are filthy and degraded in their habits, who live, either from choice or necessity, in neglect of sanitary requirements. This fact aids us in an understanding of the

CAUSES.—That uncleanliness and impure air are a cause of tetanus is as fully demonstrated as most facts in the etiology of diseases. The attention of the profession was forcibly directed to this cause by Dr. Joseph Clarke in a paper read before the Royal Irish Academy in 1789. This physician was in charge of the Dublin Lying-in Asylum, and had rightly concluded that the mortality among the new-born infants was due to imperfect ventilation. Through his advice, apertures, twenty-four inches by six, were made in the ceiling of each ward; three holes, an inch in diameter, were bored in each window-frame; the upper part of the doors leading into the gallery were also perforated with sixteen one-inch apertures, and the number of beds was reduced. The result of these simple sanitary regulations may be seen from Dr.

Clarke's own statement. He says: "At the conclusion of the year 1782, of 17,650 infants born alive in the Lying-in Hospital of this city, 2944 had died within the first fortnight, that is, nearly every sixth child." The disease in nineteen cases out of twenty was tetanus. After the wards were better ventilated, namely, from 1782 till the time of the preparation of Dr. Clarke's paper, 8033 children were born in the hospital, and only 419 in all had died, or about one in nineteen. So impressed was Dr. Evory Kennedy, who at a later period had charge of the same asylum, with the belief that Dr. Clarke had discovered the true cause, and had been able in a great measure to prevent it, that he writes in his enthusiastic way: "If we except Dr. Jenner, I know of no physician who has so far benefited his species, making the actual calculation of human life saved the criterion of his improvements." The cases occurring in my own practice were all met in tenement-houses or shanties, where habits of cleanliness are impossible, and I have not yet seen, in the practice of others, nor heard of a case which occurred in the better class of domicils. The statements of physicians in the southern States, who speak from extensive observation among the negroes, are strongly corroborative of the idea that the disease is in great measure due to uncleanliness and impure air.

Dr. Greenville Dowell, of Texas, states that he has been able to trace the disease to the old bedclothes, saturated with excrementitious matters, which are found in the negro cabins. In a paper published in the *Nashville Journ. of Med. and Surg.*, June, 1851, by Prof. John M. Watson, the frequency of this disease among the negroes is accounted for as follows:—

"When called to see their children, we find their clothes wet around their hips, and often up to their armpits, with urine. . . . . The child is thus presented to us, when, on examination, we find the umbilical dressings not only wet with urine, but soiled, likewise, with fæces, freely giving off an offensive urinous and fæcal odor, combined at times with a gangrenous fetor arising from the decomposition, not desiccation, of the cord."

Another cause is believed to be some irritation in the bowels, as from retained meconium. Observers in the southern States and elsewhere occasionally mention this as a cause. In one case treated by myself, there was obstinate constipation immediately before the attack, and in another diarrhœa preceded, and was the only apparent cause.

In certain cases the assignable cause is exposure to wet or cold, or to a variable temperature, which, it is known, occasionally, causes tetanus in the adult. Prof. Cederschjold attributed the epidemic which he observed in Stockholm to a sudden change of temperature, from hot weather in May, to frosty in June. In a case related by Dr. P. C. Gaillard, in the *Southern Journ. of Med. and Pharmacy*, Sept. 1846, the disease commenced as follows: The nurse came in with wet apron and clothes, in the evening; a short time after she had taken the child into her lap, it sneezed violently two or three times. At 10 P. M. tetanus began. In certain localities on the continent, where there are no parish churches, the frequent occurrence of tetanus has been attributed by the physicians to the practice of carrying the infants to a distance to be christened, thus exposing them to the wind and often rain. Even in this city I have observed the same cause. The influence of the weather in the production of tetanus of the new-born is also shown by facts observed in the Stuttgart Hospital. In an aggregate of twenty-five cases treated in that institution, all but three occurred in the cold months. In the island of Cayenne, at a hamlet surrounded by mountains and dense forests, tetanus attacked only one in every twelve or fifteen of the infants. After a great part of the forests had been cut down, so as to allow access to the cold sea winds, almost all the new-born infants fell victims to tetanus. (*Insel, Cayenne.*)

Hein relates that a citizen of Berlin lost, successively, two children with tetanus soon after birth. When the second child fell ill, he observed that its cradle was exposed to a current of air. At the third accouchement the position of the cradle was changed, and the infant escaped. Exposure to wet and cold has been long recognized as a cause of the disease. According to Sauvages, "Hic morbus hieme et cum aurâ humidâ sæpius advenit quam sicca æstate." (*Nosol. Method*, vol. i. p. 531.)

The causes of infantile tetanus, enumerated above, may be proximate or remote, may produce the disease by their direct effect on the system or by producing a pathological state which in turn leads to the development of the disease. There are other direct causes, namely, organic affections. In the bodies of those who die of this disease lesions are observed which doubtless result from the spasms. Again, others are found, which, from their nature, could not be a result, and which, being observed in different cases, are to be regarded as direct causes. The most frequent of such lesions is inflammation of the umbilicus or umbilical vessels.

Moschion, who lived in the first century of the Christian era, stated in writings still extant that stagnant blood in the umbilical vessels sometimes produced dangerous disease in the new-born infant, and it is supposed, though this is doubtful, that he referred to tetanus. In modern times the attention of the profession was more particularly directed to this cause by a paper published by Dr. Colles, in the first volume of the *Dublin Hospital Reports*, in 1818. The observations published in this paper were made in the Dublin Lying-in Hospital during the period of five years. In each of these years he had witnessed from three to five post-mortem examinations in cases of infantile tetanus, and the lesions, he states, were in all much alike as follows: The floor of the umbilical fossa was lined by a membrane apparently formed by suppurative inflammation, and in the centre of this fossa was a large papilla. This papilla consisted of a soft yellow substance, apparently the product of inflammation, and in all the cases the umbilical vessels were in contact with this substance and were pervious. In a few instances superficial ulcerations were found near the mouth of the umbilical vein, and occasionally the skin surrounding the umbilicus was raised. The peritoneum covering the vein was highly vascular, often not to a greater distance than an inch above the umbilicus, but sometimes as far as the fissure of the liver. The peritoneum in the course of the umbilical arteries presented the inflammatory appearance in still greater degree sometimes as far as the sides of the bladder. The connective tissue lying along the arteries and urachus anteriorly was loaded with a yellow watery fluid. The inner surface of the umbilical vein was not inflamed, but its coats, in general, were thickened. On slitting open the arteries, a thick yellow fluid, resembling coagulable lymph, was found within their coats, and in all cases these vessels were thickened and hardened as far as the fundus of the bladder.

Dr. Finckh, who observed twenty-five cases in the Stuttgart Hospital, believes that the most frequent cause was suppuration or ulceration of the umbilical cord. In ten of the twenty-five cases the navel was dry and cicatrized; in the remainder it was either wet or swollen, with a bluish-red inflamed edge at the margin of the navel; a dirty viscid pus covered the umbilical depression.

Dr. Levy, physician of the Foundling Hospital in Copenhagen, attended twenty-two cases in that institution in 1838 and '39. Of these, twenty died, and fifteen were examined carefully after death. In fourteen there were decided marks of inflammation in the umbilical arteries, especially those portions lying along the urinary bladder; in several cases the peritoneum over the arteries was much injected, and in three adherent either to the omentum or intestine by coagulable lymph; the coats of the arteries were thickened, their cavities dilated and containing dark reddish-brown or greenish puriform matter, always fetid. Sometimes the arterial tunica interna was found ulcerated and absent in places, and there was spongy thickening of the subjacent connective tissue. In two cases the ulcerative process had extended from the tunica interna to the peritoneum, and there was a deposit of thick ichorous matter around the ulcer; in one case both arteries were so softened that their coats were scarcely distinguishable, and in another these vessels had become gangrenous. The appearance of the umbilicus was unchanged in four cases; in ten the fundus was red and filled with puriform fluid, which quickly reappeared when removed, and, in general, shortly before death the navel presented a greenish color.

According to Romberg, Dr. Schöller made post-mortem examinations in eighteen cases of tetanus infantum, and in fifteen found inflammation of the umbilical arteries. These vessels were swollen near the bladder, in one case to the diameter of four lines, and were found to contain pus. The lining membrane was eroded or covered with an albuminous exudation. Both arteries were not always equally inflamed, and in three cases only one was affected.

Schneeman found minute points of suppuration in the umbilical vein in eight cases (*Holscher's Annalen*, vol. v. p. 484, 1840), and pus throughout the course of this vessel in one.

The observations mentioned above were made, for the most part, in hospitals on the Continent; but similar observations have been made in private practice. M Boiran, of the Isle of Bourbon, says that he has found in every case inflammation around the umbilicus (*Gazette Médicale*, Paris, July 11, 1841). Dr. John Furlonge (*Edin. Med. and Surg. Journ.*, Jan. 1830), who resided at St. John's, Antigua, attributes the disease to improper dressing of the umbilicus. The same opinion is expressed by Mr. Maxwell, who also saw the disease in the West Indies (*Jamaica Phys. Journ.*, copied into the *London Lancet*, April 11, 1855). Dr. Ransom states, in a communication to Prof. John M. Watson (*Nashville Journ. of Med. and Surg.*, June, 1851) that he has never seen a case of tetanus of the new-born in which the umbilicus was healthy. In a case related by Robert S. Baily, in the *Charleston Med. Journ. and Rev.*, Nov. 1848, there was a hard scab on one side of the umbilicus, and this part was much distended. A discharge followed the removal of the scab, and the child recovered. In a favorable case, related by W. B. Lindsay, in the *N. O. Med. and Surg. Journ.*, Sept. 1846, the umbilicus was tumid, and not disposed to heal. Dr. H. O. Wooten (same journal, May, 1846) attributes the disease to the condition of the umbilicus and umbilical vessels, and states that he has found the umbilicus gangrenous. In a case related in the *N. O. Med. and Surg. Journ.*, May 1, 1853, the umbilical vessels were blocked up by purulent matter. Robert A. Chime, M.D., Brazoria, Texas (*N. O. Med. and Surg. Journ.*, Sept. 1854), believes one cause of the disease to be improper tying and management of the umbilical cord, by which a diseased state is produced, which extends to the umbilicus, and thence to the viscera. At a meeting of the Obstetrical Society of Edinburgh, held April 24, 1850, Dr. Imlach related a case in which there was a dark and gangrenous appearance of the integument around the umbilicus, and the peritoneum underneath was also dark, but not inflamed; umbilical vein healthy; a little fibrin in the left umbilical artery; right umbilical artery much diseased; its two inner coats apparently destroyed, and in their place a yellow pultaceous slough, in which pus-globules were discovered with the microscope.

It is evident that the pathological state of the umbilicus and umbilical vessels described above, and which has been noticed by so many observers in different countries, cannot result from the tetanus. It is possible that the puriform substance noticed in the umbilical vessels was disintegrated fibrin, which had coagulated at the time of ligation of the cord, and the cells seen by Dr. Imlach and others may sometimes have been white corpuscles still remaining from the stagnated blood. (*Virchow's Cellul. Pathol.*) Still, the evidences of inflammation, in at least a part of the cases related above, were of a positive character.

The belief that umbilical lesions sometimes cause tetanus infantum comports with the well-known traumatic causation of tetanus in the adult. This belief is strengthened by the fact, which will appear further on in our remarks, that this disease of the newborn, from being frequent in certain localities, has become infrequent through greater care in dressing and managing the umbilical cord.

But there are cases of tetanus infantum in which there is no disease in or about the umbilicus. Dr. Finckh, of Stuttgart, examined the umbilical vessels in eleven cases without discovering any patholog [illegible] Samuel B. Labatt, master of the

Dublin Lying-in Hospital, published in the *Edin. Med. and Surg. Journ.*, April, 1819, a paper entitled "An Inquiry into an Alleged Connection between Trismus Nascentium and certain Diseased Appearances in the Umbilicus." This paper was designed as a reply to the essay of Dr. Colles. Dr. Labatt relates several cases in which there was no disease of the umbilicus and umbilical vessels, and others in which the disease was so slight that it probably produced no injurious effect on the health of the child. Dr. James Thompson, who spent considerable time in the tropical regions, says (*Edin. Med. and Surg. Journ.*, Jan. 1822): "I have myself examined nearly forty cases of infants that have sunk under this complaint. In many I have looked at no other part but the navel, and have found it in all states; sometimes perfectly healed, especially if the infants had lived several days; at other times a simple clean wound. When death occurred on the fifth or sixth day, the wound was frequently in a raw state. I never yet saw it in a sphacelated condition." This writer concludes from his observations that there are cases in which the cause is located elsewhere than in the umbilicus or umbilical vessels. In the *Dub. Journ. of Med. and Chem Sci.*, Jan. 1836, Dr. John Breen remarks: "From dissections . . . we have never been able to discover any peculiar morbid appearance which would justify us in offering any explanation of the pathology of the disease." In my own cases there was no evidence of disease of the umbilicus or umbilical vessels so far as could be ascertained by external examination, and in one (No. 32) a careful post-mortem examination disclosed no lesion of these parts.

The inference from the above observations is that, although umbilical disease may be an occasional, probably not infrequent, cause of tetanus infantum, cases occur in which such disease is not present, and we must look for the cause elsewhere. From the nature of tetanus infantum, the cerebro-spinal axis has been from time to time examined in those who have died of this disease, and occasionally sufficient cause has been found in this part of the system.

I have alluded in another connection to a case from Billard, in which tetanic rigidity occurred in an infant three days old, as the result of spinal meningitis. That tonic spasms not infrequently occur in older children in consequence of meningeal inflammation is well known, and in some of the reported epidemics of infantile tetanus meningitis was really present, and was doubtless the cause of the tonic spasms. Such an epidemic was observed by

Professor Cederschjold in Stockholm, in 1834. Within a few months he treated forty-two cases, and, in addition to the lesions which are known to result from tetanus, there was found in the bodies examined a plastic exudation at the base of the brain. Finckh, of Stuttgart, made twenty post-mortem examinations of those who had died of this disease, and in nine found spinal meningeal inflammation.

Meningitis in the new-born infant is, however, rare, and we must regard it as an exceptional cause of tetanus.

In 1846 there appeared from the pen of Dr. Sims, then practising at Montgomery, Alabama, a paper designed to show that tetanus of the new-born is produced by pressure exerted on the nervous centre, through depression of the occipital bone. In 1848 the same writer published a second paper, also in the *Amer. Journ. of Med. Sci.*, fully enunciating his theory as follows: "That trismus neonatorum is a disease of centric origin depending on a mechanical pressure exerted on the medulla oblongata and its nerves; that this pressure is the result, most generally, of an inward displacement of the occipital bone, often very perceptible, but sometimes so slight as to be detected with difficulty; that this displaced condition of the occiput is one of the fixed physiological laws of the parturient state; that when it persists for any length of time after birth it becomes a pathological condition, capable of producing all the symptoms characterizing trismus neonatorum, which are instantly relieved simply by rectifying this abnormal displacement, and thereby removing pressure from the base of the brain." In both papers cases are narrated in support of this theory, but there are serious objections to this mode of explaining the occurrence of the disease. In the first place, if this explanation were correct, tetanus ought ordinarily to occur sooner, for the occiput is as much depressed previously, and in the majority of cases more depressed than at the period when it does actually commence. Pressure on the medulla would certainly be followed by immediate and marked symptoms, instead of an immunity for four or five days.

Again, well-known facts in reference to the causation of tetanus infantum conflict with Dr. Sims's theory, as, for example, epidemics of the disease, its prevalence in one locality and absence in another, although no particular attention is given to the position of the infant, the diminution of the number of cases by greater attention to cleanliness, of which there is abundant proof. Moreover, there are many reported cases of this disease at the commencement of which there was no perceptible displacement of the occipital bone.

The inequality of the cranial bones often observed in tetanus infantum should, in my opinion, be explained as follows: When the new-born infant becomes emaciated, the volume of the brain is diminished, like that of the trunk or limbs, and the sinking of the occipital bone simply corresponds with the amount of waste in the cerebral substance. Whatever the disease in the young infant, if there is much emaciation, the parietal bones will usually be found more prominent than the occipital. Now, in fatal tetanus infantum, emaciation is very rapid; those fleshy and plump, if the disease do not speedily end, become pinched and wrinkled. Viewed in this light, the occipital depression should be regarded as a result, and not cause, of the tetanus.

Although we do not accept the theory which attributes tetanus infantum to occipital depression, there are a few cases on record in which it was apparently due to injury of the head received at birth. Dr. Sims has related one such case, that of a negro infant. The mistress, an observing lady, gave to Dr. Sims the following account of it: Its head was "mightily mashed. . . . . The bones seemed to be loose. I got it to take a little boiled milk on the first day; but it swallowed very little and very badly, for its jaws seemed to be locked. On the next day it took spasms and got stiff all over; its hands were shut up tight, and its arms were bent up so (she placed her forearms at right angles). Every time I touched it the spasm would get worse all over, screwing up its face till it was the ugliest thing in the world; and when the spasms wore off it looked as well as any other new-born baby. But then the stiffness never left it, and the spasms kept coming and going till it died." It lived two days.

It is evident, from the description given by the mistress, that this was a case of tetanus commencing at or so soon after birth that it seemed almost congenital. The apparent cause was injury of the head, occurring in consequence of protracted birth, the infant being resuscitated with difficulty after several minutes.

Dr. W. C. Sutton published a similar case in the *Nashville Journ. of Med. and Surg.*, April, 1853. The infant at birth was apparently dead, but was resuscitated so as to live eighteen hours in a state of tetanic rigidity. In cases in which tetanus begins at birth, doubtless, the cerebro-spinal axis is in some way affected; but in the absence of post-mortem examinations, the exact nature of the lesion is uncertain.

It is evident, therefore, that in this disease, as in eclampsia, the cause in different cases may be entirely distinct. Dr. James Johnson, many years ago, expressed his belief in the multiplicity of causes, and he had been a careful and intelligent observer in the West Indies.

The causes may be arranged in two groups, one external, the other internal. In the first group should be placed imperfect ventilation, personal and domiciliary uncleanliness, and atmospheric vicissitudes; in the second group, so far as ascertained, inflammation of the umbilicus and umbilical vessels, meningitis, and, rarely, injury of the cerebro-spinal axis during birth.

The lesions resulting from tetanus infantum pertain chiefly to the circulatory system. In the cases examined by Prof. Cederschjold, of Stockholm, already alluded to, the meningeal and cerebral vessels, and those of the spinal cord, the cavities of the heart, and the large vessels connected with the heart, were distended with blood.

Finckh made post-mortem inspection of twenty cases in the Stuttgart Hospital, the bodies, at death, having been placed on their faces, in order to prevent any deceptive appearance from the gravitation of blood. In four there was no appreciable alteration in the spinal cord or its membranes. In the remaining sixteen there was effusion of blood, in considerable quantity, the whole length of the spinal cord, between the bony walls and the dura mater. It should be stated, however, that there was spinal meningeal inflammation in nine of the sixteen, though the extravasation did not, probably, result from the inflammation, but from the tetanus. The blood in Finckh's cases was very dark, sometimes fluid, at other times coagulated. In one case there was no change in the appearance of the brain or its membranes. In the remaining nineteen, more or less extravasated blood was found on the surface of the brain, or in its interior. The substance of the brain was healthy, as also its membranes, except the congestion. The only abnormal appearance observed in the thoracic and abdominal viscera was strong contraction of some portion of the intestinal tube in five cases. Dr. West says: "The most frequent post-mortem appearance in these cases"—referring to tetanus infantum—"and that which I found in the bodies of all the four children whom I observed, consists of effusion of blood, either fluid or coagulated, into the cellular tissue surrounding the theca of the cord. Conjoined with this there is generally a congested state of the vessels of the spinal arachnoid, and sometimes an effu sion of blood or serum into its cavity. The signs of congestion about the head are less constant, though much oftener present than absent, and sometimes existing in an extreme degree; while in one instance I found not merely a highly congested state of the cerebral vessels, but also an effusion of blood, in considerable quantity, between the skull and dura mater, and also a slighter effusion into the arachnoid cavity." Dr. Weber, of Kiel, also placed infants who had died of tetanus on their faces, and, without exception, found injection of the capillaries of the cord and spinal meninges, and extravasation of blood. M. Matuszynski, according to Bouchut, "has observed effusions of blood, of variable quantity, in the cerebral pia mater, in the ventricles, and in the choroid plexuses, with considerable injection of the membranes of the brain. He has also seen serous infiltration beneath the arachnoid, and serous effusion into the ventricles, accompanied by a diminution of the consistence of the cerebral substance." In two cases examined by myself, there was intense injection of the cerebral meninges, and of the meninges of the upper part of the spine, but no extravasation was noticed. The spinal canal was not opened. In a third case, in which the spinal canal was opened, there was extravasation in addition to the congestion; this was especially observed along the spinal theca.

Dr. H. O. Wooten (*N. O. Med. and Surg. Journ.*, May, 1846) states that he has made several post-mortem examinations, and has found the pathological appearances as uniform as in any other disease, as follows: "Engorgement of the substance of the brain, and of the meninges lining the base of the brain, the medulla oblongata, and spinal marrow; liver congested."

In a case related by Dr. Imlach before the Edin. Obst. Soc., April 24, 1850, the upper part of the lungs was healthy, the posterior portion congested, and containing many dark points; heart and liver healthy; small intestines of a light-brown color; stomach and large intestines pale; there had been umbilical hemorrhage.

Romberg states that he found in a child, whose death occurred from this disease, such intense congestion of the veins and sinuses of the brain, that a slight touch, and the removal of the cranial bones, produced extravasation of the partly coagulated and partly fluid blood. Dr. Schöller, on the other hand, found actual extravasation of blood in the spinal canal in only one case in eighteen.

It is seen from the above observation, that tetanus of the infant is ordinarily accompanied by great passive congestion, which is especially marked in the cerebro-spinal axis, and that frequently extravasations occur from the distended capillaries. The embarrassment of respiration and the retarded circulation of blood consequent on the tetanic rigidity afford sufficient explanation of this state of the vessels.

SYMPTOMS.—In many cases premonitory symptoms are absent, or are so slight as to escape notice. Sometimes there is a degree of fretfulness previously, but no more than is often observed in those who continue in good health. The first symptom which alarms the parents, and shows the grave nature of the commencing disease, is inability to nurse, or evident pain and hesitation in nursing. Commencing with rigidity of the masseters, the disease gradually extends to the other voluntary muscles, and in the course of a few hours the muscles of the limbs, as well as of the trunk, are involved. Persistent muscular contraction, which is the pathognomonic feature of infantile tetanus, is developed not fully in the beginning, but by degrees in each affected muscle, so that it is not till after the lapse of several hours, perhaps even a day, that the greatest amount of rigidity is attained. Therefore, in the commencement of the disease, the limbs can be bent, and the jaws pressed open, more readily than at a subsequent stage, though with manifest pain to the infant.

During the period of maximum rigidity, the jaws are fixed almost immovably, often with a little interspace between them, against which the tongue presses, and in which frothy saliva collects. The head is thrown backward and held in a fixed position by the stiffness of the cervical muscles. The forearms are flexed; the thumbs are thrown across the palms of the hands, and are firmly clenched by the fingers; the thighs are drawn towards the trunk; the great toes are adducted, and the other toes flexed. Occasionally opisthotonos results from the extreme contraction of the dorsal and posterior cervical muscles. The infant can sometimes be raised without any yielding of the muscles, by one hand under the occiput and the other under the heels.

The rigidity is liable to variation in its intensity, even after the full development of the disease. If the infant is quiet, especially if asleep, the muscles are partially relaxed to such an extent, sometimes in the first stages of the complaint, that the features have a placid and natural expression, though only for a short time. There are frequent exacerbations in the muscular contraction, sometimes occurring without any apparent cause, and sometimes produced by anything which excites or disturbs the child. Attempts to opethe lips or jaws, or eyelids, or to bend the limbs, blowing on the face, or even the crawling of a fly upon it, occasions the paroxysm.

During the paroxysm the eyelids are forcibly compressed, as well as the lips, which are either drawn in or are pouting; the forehead and cheeks are thrown into wrinkles, and the physiognomy is indicative of great suffering. The unnatural positions of the trunk and limbs, which result from the muscular contraction, are increased for the moment; the head is more forcibly thrown back, and the limbs more strongly flexed. The muscular movements which occur during the paroxysms are sometimes described as clonic spasms. There is indeed occasionally some quivering of the limbs, and yet, as I have on different occasions noticed, so far from the muscular action being a clonic spasm, it possesses a tonic character, which is at times intensified. In fatal cases the paroxysms occur more and more frequently until the period of collapse.

The crying of the child affected by tetanus is never loud, however great the suffering. It is variously described by writers as "whimpering" or "whining." It is of this suppressed character in consequence of the rigid state of the respiratory muscles and their imperfect movement.

During the exacerbation respiration is suspended, or so imperfect, and the circulation so retarded, that the surface becomes of a deep red, almost livid, color. Sometimes epistaxis occurs, affording partial relief to the congestion, and sometimes, though less frequently, the blood forces itself from the congested liver along the umbilical vein, and escapes from the umbilicus. I have already alluded to the occurrence of meningeal apoplexy.

The frequency of the pulse and respiration varies in different cases, and at different stages of the same case. They are often somewhat accelerated, but at other times are natural, or are even slower than in health.

While the appetite of the infant, to appearance, is not diminished, the pain which it experiences in nursing is such that alimentation is necessarily deficient. It can be fed with a spoon for a time after it ceases to take food in the natural way, but artificial feeding soon fails. The milk placed in its mouth is in great part pressed back through the violence of the spasm which is induced by the attempt to feed it.

In consequence of imperfect nutrition, the infant rapidly wastes away. There is no other disease except the diarrhœal affections in which emaciation is so rapid. In a case related by Dr. W. B. Lindsay in the *N. O. Med. Journ.*, Sept. 1846, the record states that "the infant was fat three days before, but was now emaciated." Romberg, who saw tetanus infantum in European hospitals, and Dr. Robert H. Chinn, of Texas (*N. O. Med. and Surg. Journ.*, Sept. 1854), both speak of the rapid emaciation. The trunk and extremities lose their fulness, and the features become pinched. Several observers have noticed the appearance of miliaria in this reduced state of system, especially around the shoulders, and sometimes a decidedly icteric hue appears on the skin.

The condition of the bowels is not uniform. They may be relaxed, particularly if the disease is due to some irritation in them; in other cases the stools are natural or constipated.

It is often difficult to ascertain the state of the eyes, since attempts to open the eyelids bring on spasms and cause firm compression of the lids against each other. According to Sir Henry Holland, one of the first symptoms which occurred in cases on the island of Heimacy, was strabismus, with rolling of the eyes. But this statement must be received with caution, since these cases were not seen by any physician, and the information was obtained from the parents and priests. If true, the proximate cause of the disease in Heimacy would seem to be located in the cerebro-spinal axis. Contraction of the pupils commonly occurs in the stage of collapse.

Mode of Death.—Death in infantile tetanus may occur from apnœa in the paroxysms, from extreme congestion of the cerebral vessels, or apoplexy; and, lastly, it may occur from exhaustion. The last mode is, probably, the most frequent.

Prognosis.—All writers till recently agree that tetanus of the infant rarely terminates favorably. Cullen attributes the ignorance of physicians in regard to this disease to the fact that it is so little amenable to treatment, that they are not usually summoned to attend those affected with it. In the island of Heimacy, of one hundred and eighty-five cases, occurring during a series of years about the commencement of the present century, not one survived; and in the same locality, at a more recent period, according to the report of Dr. Schleisner already alluded to, sixty-four per cent. died. Similar statements in regard to the mortality of tetanus infantum are given by physicians in the southern States. Dr. H. O. Wooten, of Alabama, says (*N. O. Med. Journ.*, May, 1846) that he has "never seen a decided case of tetanus nascentium that did not prove fatal; . . . and that it is very generally deemed useless to call in medical aid after the initiatory symptoms are well declared." Mr. Maxwell, speaking in reference to the West Indies, says (*Jamaica Phys. Journ.*, copied into the *London Lancet*, April 11th, 1835): "From observations which I have made for a series of years, . . . I found that the depopulating influence of trismus nascentium was not less than twenty-five per cent. It scarcely has a parallel within the bills of mortality." Dr. D. B. Nailer (*N. O. Med. Journ.*, Nov. 1846) says: "About two-thirds of the deaths among the negro children are from this disease, and so uniformly fatal is it, that a physician is never sent for."

Yet death does not always result. Eight of the forty cases in my collection recovered; but a correct opinion cannot be formed from this of the actual ratio of favorable to unfavorable cases, since favorable cases are much more likely to be published. In the history of these eight cases, two interesting facts are noticed, which, when present, may serve as a ground for hope of a successful termination. These were, the age at which the disease began, and fluctuation in the symptoms. With two exceptions, the infants who recovered were about a week old when the initiatory symptoms appeared, and there were fluctuations in the gravity of the symptoms; whereas, fatal cases ordinarily grow progressively worse. Yet, in favorable cases, the symptoms are never so severe as they become in a few hours in those who succumb.

DURATION IN FATAL CASES.—Of eighteen cases observed by Finckh in the Stuttgart Hospital, fifteen died in two days, two in five days, and one in seven days. During the epidemic in the Stockholm hospitals, in 1834, where forty-two cases were treated, the disease seldom lasted more than two days. Romberg says: "It generally lasts from two to four days, but its duration is at times limited at from eight to twenty-four hours, and occasionally, though rarely, it extends from five to nine days."

In thirty-one fatal cases in my collection, in which the duration is mentioned—

One lived	3 hours.
Eleven others lived	1 day or less.
Twelve lived	2 days.
Four "	3 "
Three "	4 "

Both Underwood, who published a little treatise on diseases of children, in 1789, and Dr. Elsässer at a more recent date, record fatal cases which were unusually protracted. The one described by Underwood was treated in the British Lying-in Hospital, and, although all the others treated in this institution died by the third day, this lived six weeks; but it is suggested by the author, that death was due in part to some other affection. The child treated by Elsässer lived thirty-one days.

Duration in Favorable Cases.—In the eight favorable cases in my collection, the duration of the disease, reckoned from the time when the infant ceased nursing till it began again, was as follows: In one case, two days; in one, a few days; in one, fourteen days; in two, fifteen days; in one, twenty-eight days; in one, twenty-one days; and in the remaining case, about five weeks.

Diagnosis.—To one who has seen this disease in the new-born, or is familiar with its symptoms, diagnosis is easy. The symptoms which possess diagnostic value are more manifest and reliable than in most other infantile affections. Permanent rigidity of the voluntary muscles, with temporary exacerbations, such as have been described above, which are induced by any cause which disturbs the infant—as attempts to open the mouth or eyelids—is pathognomonic.

Preventive Treatment.—While tetanus infantum, if fully developed, is ordinarily fatal, in spite of any remedial measures heretofore used, there is no doubt of the efficacy and value of preventive measures, when properly employed. This was shown by the great reduction in mortality in the Dublin Lying-in Hospital through the thorough ventilation introduced by Dr. Clarke. Dr. Meriwether, of Montgomery, Ala., says (*Amer. Journ. of Med. Sci.*, April, 1854): "When the disease appears endemically on a plantation, it may be arrested by having the negro houses whitewashed with lime, inside and out; by raising the floors above the ground; by removing all filth from under and about the houses; by particular attention to cleanliness in the bedding and clothes of the mother; and in the dressing of the child, so as to prevent any of the matter from the umbilicus lying long in contact with the skin." Many physicians, especially in the Southern States, speak confidently of care in dressing the cord, and attention to the umbilicus, as a means of prevention. In the *N. O. Med. and Surg. Journ.*, July, 1853, Dr. Grafton says that he has "never known the disease to occur in any child whose navel had the turpentine dressing." He uses turpentine as follows: "At the first time, a few drops of the undiluted turpentine are applied immediately to the umbilicus around the cord, and it is anointed at every succeeding dressing, the turpentine being diluted one-half or two-thirds with olive oil, lard, or fresh butter." This use of turpentine has also been recommended by other practitioners in the warm regions.

Dr. John Furlonge, of St. John's, Antigua, believes (*Edin. Med. and Surg. Journ.*, Jan. 1830) that no case would occur with the following treatment: "The cord, when divided, should be wrapped in clean linen. Every night, for two weeks, one or two drops of tinct. opii and spts. vini, equal parts, should be given, and castor oil, with a little magnesia, every morning. The child must be washed in tepid water every morning, and the funis dressed." If this treatment is attended by the success which is claimed for it by Dr. Furlonge, so great care in dressing the cord is certainly well repaid in localities, as at Antigua, where a large proportion of the infants die of tetanus.

Some experienced observers go so far as to assert that it is possible to ward off tetanus infantum after the occurrence of premonitory symptoms. Dr. Dowell says (*Amer. Journ. of the Med. Sci.*, January, 1863): "Some with slight twitchings of the muscles, have recovered without any trouble by being put into a mustard-bath, washed clean, and put in a clean and well-ventilated cabin."

TREATMENT.—In considering the effect of medicinal agents which have been employed in the treatment of infantile tetanus, the great difficulty which the child experiences in swallowing should be borne in mind. Without care, a considerable part of the dose is lost by the spasm of the muscles of deglutition, which ordinarily occurs when the spoon is placed in the mouth, so that, unless special attention is given to this matter, it is uncertain whether the prescribed dose is fully administered.

The treatment employed by different physicians has been very diverse. Antiphlogistic remedies were prescribed by Finckh, but every case so treated was fatal. He states that whenever blood was abstracted, even in small quantities, the symptoms were aggravated. The same result has followed depletory measures in the practice of other physicians.

The internal remedies which have been most frequently prescribed are opiates and antispasmodics. Furlonge, in a favorable case, gave laudanum, in doses of one drop every three hours, alternately with two grains of Dover's powder. Woodworth also gave one-drop doses of laudanum; Eberle, one-sixth of a drop hourly. The opiate has generally been given in combination with an antispasmodic. The Dover's powder, given every three hours by Furlonge, was combined with five grains of sulphate of zinc. The hourly doses of laudanum, by Eberle, were combined with six drops of tincture of assafœtida.

When anæsthetics began to be employed in the treatment of diseases it was believed that they would be especially useful in cases of tetanus. Accordingly chloroform has been used in tetanus in the infant, with the effect of controlling the spasms during the time of its use, but without curing the disease. In Case 7 in our first table it was employed several times, but apparently without delaying the fatal result. The editor of the *New Orleans Medical and Surgical Journal* states, in the May issue of that periodical for 1853, that he has used chloroform in tetanus infantum, with the effect, he believes, of prolonging life. Anæsthetics certainly relieve the suffering of the infant, and on this account, even if they do not prolong life, their judicious employment seems proper.

The remedy which, in my opinion, is far preferable to all others, is hydrate of chloral. Since the introduction of this agent into therapeutics, it has been employed by several physicians in the treatment of this disease with so good a result that it will probably supersede all other medicines for this purpose. Dr. Widerhofer, of Vienna, states that he has saved six out of ten or twelve by the use of chloral (*London Lancet*, March 18, 1871). He prescribes it in doses of one to two grains by the mouth, or, if there is great difficulty in swallowing, two to four grains by the rectum. Dr. F. Auchenthales relates a case (*Jahrb. f. Kinderheil.*, N. S. IV.) in which he gave even six-grain doses, and in nine days the disease had entirely disappeared. I have employed hydrate of chloral in only one case of tetanus infantum, giving it in half-grain doses, every two hours, except when there was profound sleep. The disease was fully developed, and the symptoms severe when I was called. I did not believe that the infant with the old remedies would live more than two days, but by the chloral life was prolonged nearly one week. Moreover, by the use of chloral the suffering of the infant is greatly diminished.

The administration of alcoholic stimulants is required at short intervals on account of the rapid emaciation and great prostration.

Local treatment directed to the umbilicus in those cases in which there is evidence of inflammation of the umbilicus or umbilical vessels should not be neglected. Vesication of the umbilicus, and the application of poultices to it, have been followed by unquestionable benefit, if we may believe the statement of some physicians who have made use of these measures. Dr. Merriwether, of Alabama, says, if there is no improvement from the medicine which he orders, he applies a blister, larger than a dollar, to the umbilicus, and with this treatment the child generally improves; a remarkable statement, since so few improve at all.

A warm foot-bath repeated at intervals of a few hours, and stimulating embrocations along the spine, are proper adjuvants to the treatment.

CHAPTER XIII.

INTERNAL CONVULSIONS.

YOUNG children are liable to temporary suspension of respiration, induced by violent emotions, especially by anger. In the midst of their excitement, while they are crying or screaming, their breath is suddenly held, as if from tonic spasm of the respiratory muscles. In a few seconds respiration returns, and is natural. There is no stridulous inspiration or other unusual sound, and there is no apparent ill effect, unless occasionally a degree of languor. External convulsions, which seem to be threatening, seldom occur, and when they do, are ordinarily mild. Some writers consider dentition the predisposing cause of this arrest of respiration, by inducing a sensitive state of the nervous system. Such an effect of dentition is possible, but certainly many infants are affected in this manner before the age of dentition.

A much more serious state, and one which is recognized as a true disease, is that variously designated by writers as internal convulsions, spasm of the glottis, child-crowing, laryngismus stridulus, etc. Manifest difficulties attend the investigation of the pathological state in this disease. There can be little doubt that it is not precisely the same in all cases. That there is, during the paroxysms, tonic or clonic spasm of more or fewer of the respiratory muscles is inferred not only from the symptoms pertaining to the respiratory apparatus, but from the fact that in severe cases there are often spasms of the external muscles, as those of the limbs and face. Usually, also, the movements of the eyeballs indicate spasmodic contractions of the motor muscles of the eyes. The occurrence of these contractions in parts that are visible justifies the belief that they occur in other parts which are concealed from view, especially as the characteristic symptoms cannot be readily explained except on this supposition. Trousseau says: "Internal convulsions consist, then, principally in a spasm of the diaphragm and of the respiratory muscles of the abdomen and chest; but it occurs, also, that the muscles pertaining to the larynx are affected with spasm at the same time with these." Rilliet and Barthez conclude from the symptoms that the "heart is not always a stranger to this internal convulsion, which, perhaps, prolongs itself even to the intestines." The muscles of the pharynx appear to be involved, in some cases, as well as those of respiration, rendering deglutition difficult. In one form of internal convulsions, namely, that which is principally referred to by writers, there is not complete arrest of respiration, but the inspirations, during the paroxysm, are difficult and are attended by a stridulous noise. Again, the respiration may cease entirely, but when it commences it is stridulous, and difficult for a few inspirations. In still another form of the disease respiration ceases, but there is no symptom or sign indicative of glottic spasm or of an obstacle to the ingress of air; the inspirations which succeed the paroxysm are easy and noiseless. It has been suggested that, in these cases, there is paralysis rather than spasmodic contraction of the respiratory muscles, but the symptoms may be explained in accordance with the commonly accepted opinion, namely, that there is spasm of the diaphragm and, perhaps, some of the muscles of the chest and abdomen, while the laryngeal muscles are not affected. M. Herard, indeed, who has written one of the best monographs on internal convulsions, describes three forms of the disease, according to the supposed location of the spasm, namely, laryngeal, diaphragmatic, and another, which consists of a blending of the two.

Internal convulsions are not frequent in this country; they are rare in France, more frequent in Germany, and quite common in England. They occur, with few exceptions, before the age of two years. Dr. West observed thirty-one cases under the age of two years, and only six above that age.

CAUSES.—The causes of internal convulsions are not fully ascertained. Most observers have remarked the relative frequency of the disease during the period of dentition, and it is probable that dental evolution does operate as a cause, by rendering the nervous system more impressible.

Spasm of the glottis has been attributed to enlargement of the thymus gland, and also to enlargement of the cervical and bronchial glands. It is presumed that this effect is due to the pressure of these glands on the par vagum, or the recurrent laryngeal nerve. It is certain, however, that there is no such enlargement of the thymus gland which could possibly produce glottic spasm, or any other form of internal convulsions at the age at which these convulsions commonly occur. This gland is largest in the new-born, and having no function after birth, it gradually becomes atrophied. If enlarged thymus could produce glottic spasm, it would certainly occur most frequently in the new-born. Abnormal development of the thymus gland was the only assignable cause of atelectasis in two infants who died soon after birth, but I have never seen a case in which a convulsive attack was referable to this cause. M. Herard examined the thymus gland in six children who died of internal convulsions, and in sixty who died of other affections, and was not able to discover in its condition any causative relation to this disease. Indeed, cases have been reported in which the thymus had undergone more than its usual atrophy at the time when the convulsions occurred (Hasse). Enlargements of the lymphatic glands in the vicinity of the pneumogastric or recurrent laryngeal nerve may possibly give rise to glottic spasm, but this is doubtless an infrequent cause, if it be a cause at all, since these glands are often greatly enlarged in strumous and tubercular diseases without such a result. According to Dr. Jacobi (*N. Y. Journ. of Med.*, Jan. 1860): "In some cases described by Dr. Friedleben, a congenital hypertrophy of the thyroid gland has probably been the cause of laryngismus. The patients were new-born infants of normal development, and born by normal labors. There were no constitutional causes of the disease, but a remarkable vascular swelling of the thyroid gland. Whenever the swelling increased, the veins of the face and head increased in size also, the face grew livid, and the extremities and spinal column exhibited slight tonic convulsions. The recurrent nerves were entirely surrounded by the glandular tissue, their neurilemma looked unusually red, and their functions were probably injured during the occasional swelling taking place during lifetime."

The cause is occasionally located in the cerebro-spinal axis. Thus Dr. Coley relates a case in which an exostosis arising from the internal surface of the occipital bone pressed upon the cerebellum, while nothing abnormal was discovered in other organs. There are also striking examples in which the cause was located in the spinal cord. Thus Marshall Hall relates the following case communicated to him. A child with spina bifida was attacked with croup-like convulsions, whenever it lay so as to press on the tumor.

In some patients there is evidently an hereditary predisposition to this disease; those affected belonging to families in which there is a tendency to convulsive affections. Thus Toogood relates that five infants of the same family were affected with spasm of the glottis; and Reid relates, on the authority of Powel, that of thirteen infants of the same parents only one escaped internal convulsions.

The common predisposing cause is an excitable state of the nervous system, often associated with impaired general health. Hence the disease is more prevalent in cities, where anti-hygienic conditions abound, than in the country. Hence, too, the frequent improvement when the patient is removed to the pure and bracing air of the country. The use of insufficient food, or food of a bad quality, must for the same reason be considered a cause, as it leads to impoverishment of the blood, and renders the nervous system more impressible. Facts mentioned by Reid and others show conclusively the influence of premature weaning, and of indigestible or otherwise improper aliment, in the production of this disease.

The causes enumerated above are for the most part predisposing; occasionally they are the only apparent causes, since this disease sometimes occurs when the child is perfectly tranquil, even in the midst of quiet sleep, or when it is at rest in its mother's arms. In other cases, and more frequently, there is an exciting cause, often trivial. Anything that requires exertion on the part of the infant, or that excites strong emotions, may be a direct cause, as anger, or any of the violent passions; so may even coughing, or, in rare instances, attempts to swallow. One author has known it to occur from excitement produced by examining the throat with a spoon. In a case in my practice, hereafter related, it occurred whenever the infant cried violently. It appears from the above facts that the etiology of internal convulsions is very similar to that of eclampsia. The same spasmodic muscular contraction may occur from a variety of causes.

ANATOMICAL CHARACTERS.—While, therefore, structural changes in various parts of the system may give rise to internal convulsions, this disease, so far as ascertained, presents no anatomical characters, and must consequently be considered one of the neuroses. The lesions of the respiratory apparatus, observed at post-mortem examinations, are either due to the convulsions or are coincidences. Emphysema has sometimes been observed as a result, it is believed, of the spasmodic and irregular respiration. It wa
Herard's cases, and Rilliet and Barthez consi
who die of this affection, although they
of their cases. Slight emphysema occ

however, a common lesion in feeble infants, whatever the disease of which they die. Therefore its occurrence in internal convulsions is probably more due to molecular change in the lungs, since these patients are cachectic, than to the irregular breathing, which is only momentary.

In fatal cases of internal convulsions the blood is darker than usual, from an excess of carbonic acid; the cavities of the heart and large vessels are sometimes engorged with blood, but in other cases they contain no more than the normal amount. More or less passive congestion occurs in the internal organs; and congestion of the cerebral vessels is sometimes such that transudation of serum occurs.

SYMPTOMS.—I have said that the symptoms vary according to the seat and function of the muscles which are affected. There is generally previous ill health. The child is drooping, and is sometimes restless for days before the disease appears. Finally, if the muscles of the glottis become affected, the peculiar crowing sound is heard now and then during inspiration. It is observed especially when the child is crying or is agitated. It may be loud and well defined from the first, but in most patients it comes on gradually, so that several days elapse before its full stridulous character is developed. The attacks are more frequent and severe at night, in or after the first sleep, than in daytime.

Under favorable hygienic conditions, the disease may pass off without becoming more serious. In other cases the paroxysms gradually increase in frequency and severity. The dyspnœa in the attack is such that the features are livid, the head forcibly retracted, and death seems imminent from apnœa. In these severe paroxysms respiration often ceases entirely for a moment. When the spasm ends, a deep stridulous inspiration occurs, after which the breathing is natural. It has been stated that internal convulsions are often associated with those, usually tonic, but sometimes clonic, of the external muscles. In the tonic form, the thumbs are flexed across the palms of the hands, and sometimes are grasped by the fingers; the great toes are adducted, and the other toes flexed. In severe cases, the hands, forearms, feet, and legs are also somewhat flexed and rigid. At first, the contraction of the external muscles is temporary, either corresponding with the internal spasm, or it is most intense at the time of the spasm, though commencing sooner and subsiding later. After a while, however, if the disease continues, the external contraction becomes more persistent. In severe cases, nearly every inspiration is accompanied by the wheezing sound, and the paroxysms of dyspnœa are excited by trifling causes. Anything that suddenly disturbs the mind or body may bring on the attack, as anger, the impression of cold, or currents of air. Dr. West calls attention to the fact that an anasarcous condition is sometimes present, accompanied by albuminuria.

If the convulsions affect other muscles, as the diaphragm or the pectoral and abdominal muscles, which are concerned in the respiratory function, while those of the larynx escape, respiration is irregular, or even suspended for a moment, but the stridulous laryngeal sound is absent, as there is no obstacle in the larynx to the entrance of air. In this form of the disease, the infra-mammary region may be strongly retracted during the paroxysm from tonic contraction of the diaphragm. In severe paroxysms, whether the spasm be laryngeal or diaphragmatic, consciousness is nearly or quite lost, the features may be pallid, or, if respiration be suspended, may be more or less livid. There is no fever in simple cases. In the paroxysm there is often relaxation of the sphincters of the bowels and bladder, with involuntary evacuations.

The duration of the paroxysm may be a quarter, a half, or even a whole minute. Total suspension of respiration for even half a minute involves danger. In mild cases there may be but few paroxysms, and they slight. In other instances they occur in a severe form, almost daily for several weeks or even months. In the following case the muscles of the larynx were apparently not involved. The patient was scrofulous, and has since had scrofulous periostitis, with necrosis and exfoliation of the surface of the tibia. At the time of the internal convulsions there was also a scorbutic or hemorrhagic cachexia.

Case.—On the 28th of August, 1858, a German female infant, fourteen months old, nursing, and having eight teeth, was suddenly seized with clonic convulsions. Uniformly delicate and pale, she had been in her usual health till the age of twelve months, when she had a single convulsive attack, and from that date had remained well till August 27, when, without any premonitory symptom, she had a stool consisting of almost pure blood, black and offensive. On the morning of the 28th a similar evacuation occurred, and another in the afternoon immediately preceding the convulsion. Pulse 128, after the convulsion; surface cool and pallid; flesh soft, but no emaciation. Turpentine was prescribed in two-drop doses every two hours, and laudanum in one and a half drop doses repeated sufficiently to insure quietude.

On the 29th the pulse was 152. At 1 P.M. she had a general convulsion, lasting about five minutes; in the evening she had an evacuation similar to those passed on the preceding day. The record for August 30 states: "Pulse from 150 to 160; up to this time has been playful, but is now drowsy, and, when disturbed, fretful; manifests no desire for solid food, as before her sickness, but still nurses; has taken up to this time thirty-two drops of turpentine. When she cries or frets, she has a spasmodic attack." This was the commencement of internal convulsions, with which this child was affected for several months. An opportunity was afforded of observing their character, for her excitement, when she was examined, was usually sufficient to produce them. After a succession of short expirations, respiration ceased; for a moment she was apparently insensible; eyes closed; face pale; no frothing at the mouth. The return of consciousness and respiration was without any laryngeal râle; and after the attack she seemed as well as before. No external convulsion and no evacuation of blood occurred after August 31.

There was gradual improvement in her health, but she continued for many months pallid and irritable, and subject to attacks of internal convulsions. On the 11th of April, 1859, when twenty-two months old, she had another attack of general convulsions. The record made on that day is: "Has had internal convulsions (one or more paroxysms) almost every day since last August, brought on usually by crying when she is corrected in any way, or her wishes are refused." Again, on Dec. 1, 1859, it is stated: "Has grown considerably since the last record, and appears to have recovered, except that at long intervals the spasms still occur." She took a preparation of iron, but her recovery seemed to be due more to the growth and development of the body, and to hygienic than therapeutic measures.

The general health in internal convulsions is more or less impaired, except in mild forms of the disease, in which the convulsive attacks soon cease. Pallor, or a sickly and cachectic aspect, irregular, usually constipated bowels, poor appetite, and moroseness or irritability of temper, are common symptoms of severe and protracted cases.

Diagnosis.—This disease is easily diagnosticated, unless when its symptoms are masked by those of external convulsions; it may then escape notice. Spasm of the glottis may be mistaken for spasmodic laryngitis, and *vice versa.* In some of the published cases this mistake appears to have been made. Spasmodic laryngitis is, however, so different not only in its nature, but in its clinical history, that a differential diagnosis is not difficult. It is an inflammatory disease, and is attended with febrile reaction and a sonorous cough; it commences at night after the first sleep, and from exposure to cold—particulars in regard to which it contrasts with true spasm of the glottis.

Prognosis. Modes of Death.—Statistics show great mortality in this disease. Dr. Reid, in a monograph on "Infantile Laryngismus," states that of 289 cases which he collated, 115 died. Rilliet and Barthez met with one favorable case in nine unfavorable; and Herard, one in seven. If the paroxysms are mild, infrequent, and dependent on a cause which can be easily removed, recovery is probable with proper treatment. The cause may, however, be such, even when the spasm is mild, that the case is necessarily unfavorable; as when it is due to disease of the cerebro-spinal axis. We should not, however, in any case consider the patient entirely safe, since grave symptoms may suddenly arise, so as to change entirely the prognosis. Long and severe paroxysms, with lividity of the face, and symptoms of suffocation, indicate an unfavorable result. The same should be predicted also if the infant gradually waste away, losing appetite and strength, especially if the face is pale and the pulse feeble.

There are three modes of death in internal convulsions. The first is apnœa. The infant dies suffocated in the attack. Respiration is first arrested, and then the pulse ceases, and at the autopsy the lungs and the cavities of the heart are found engorged with dark blood. Death may also occur from the state of the brain. In such cases, passive congestion of the brain occurs from obstruction to the return of blood from this organ to the heart and lungs; and if this congestion is not soon relieved, serous effusion also occurs. Death results from the congestion, and consequent œdema or dropsy.

The third mode of death is from exhaustion. Repeated and severe attacks undermine the constitution; the infant grows pale and thin gradually, and dies of inanition, or of some disease which this state induces.

TREATMENT.—The treatment of internal convulsions has varied according to the theories which physicians have held in reference to its cause. Glandular enlargement is no longer regarded as a common cause, and therefore treatment directed to its removal is less frequently employed than formerly. The causes of internal convulsions are in part very similar to those of eclampsia, and the remedies employed in the one affection are, in a measure, appropriate in the other. That dentition is sometimes a cause, is usually admitted; and two cases, one of which occurred in my practice, and the other was reported to me, clearly show the truth of this belief. The effect of dentition is especially observed in weakly infants, when several dental follicles are undergoing active evolution. Thus, in one of the cases to which I refer, five teeth pierced the gums in the course of two weeks; after which no convulsive attack occurred. If, therefore, the gums are swollen, scarification is proper.

In all cases of internal convulsions a careful examination should be made, in order to detect any appreciable cause of nervous excitation. The condition of the digestive organs should be ascertained, and evacuants or other remedies prescribed if there is evidence of their derangement.

Sometimes the alimentation of the infant is in fault. It is, perhaps, bottle-fed, and the stools have an unhealthy appearance. Attention should be given to the preparation of its food and the times of its feeding; or, if it nurse, the mother or wet-nurse who suckles it should have plain but nutritious diet, live with regularity, and give the breast to the infant at regular intervals. If there is a torpid state of the bowels, Dr. Meigs recommends "castor oil and aromatic syrup of rhubarb rubbed up together, three parts of the former and five of the latter." A simple enema answers well in such cases, and, in debilitated infants, this is preferable to medicine administered by the mouth. If there be diarrhœa, and it persist after the requisite changes are made in regard to the diet, remedies calculated to relieve it, and which are detailed elsewhere, should be employed. Marshall Hall states that he has ordinarily succeeded in curing the disease by attending to the condition of the gums and digestive organs.

In pallid and cachectic infants, tonics are required. The elixir of Calisaya bark in half-teaspoonful doses, three or four times daily, to an infant of one year, is an eligible preparation. The compound tincture of bark, or of gentian, or the two mixed, may be given instead of the Calisaya bark. The preparations of iron are sometimes to be preferred. The best of these are the syrup of iodide of iron, tincture of iron, or the wine of iron. To an infant of one year the syrup may be given in doses of four drops, the tincture of two drops, and the wine in doses of one teaspoonful, three times daily. If the child is old enough, it may take iron in lozenges, as those of chocolate and iron.

Antispasmodics, as assafœtida, valerian, and oxide of zinc, are often prescribed in this disease, but they are less efficacious than the general tonic measures which I have indicated. The salutary effect of bromide of potassium in eclampsia, and certain epileptiform attacks, certainly justifies the trial of this agent in internal convulsions, if they persist after the employment of invigorating measures.

Hygienic measures are of the utmost importance. The infant should reside in dry and airy apartments, and should be kept much of the time through the day in the open air. Remarkable success sometimes attends this simple expedient, when medicines have entirely failed. In the *London Med. Gazette*, Jan. 14, 1865, Mr.

Robertson, of Manchester, relates five severe cases in which this disease was cured by exposure of the infants several hours daily to a cool atmosphere. These cases were treated in the winter months, and were kept out-door, even during strong winds. Mr. Robertson has records of forty cases, all occurring between December and April, while he has seen no case in the summer months. As the result of such extensive experience, this writer recommends "the free exposure of the infant out of doors, for many hours daily, to a dry, cold atmosphere, and if the air be dry, the colder the better." Dr. Marshall Hall's experience was similar. Says he: "The curative influence of change of air, and especially of the sea-breezes, is not less marked in this affection than in hooping-cough." Mr. Robertson recommends also, as part of the tonic treatment, "free sponging of the body every morning with cold water." In February, 1867, I attended a nursing infant, five months old, with internal convulsions, the paroxysms being attended with lividity of the face, and, at times, tonic convulsions of the limbs. Among the remedies employed was bromide of potassium, but more benefit obviously accrued from keeping the infant much of the time in the open air, than from the medicines employed. The disease passed off in six or eight weeks.

Unless the cause is of such nature that it cannot be removed, the above hygienic and therapeutic measures will, in a large proportion of cases, be followed by a satisfactory result.

The mother or nurse may abridge the paroxysm by raising the infant, blowing upon it, sprinkling water in the face, or gently stroking it. Dr. Hall recommends tickling the nostrils with a feather, to produce respiration, or the fauces, to occasion vomiting, and thereby interrupt the paroxysm. Anything which produces a sudden and profound effect upon the system may abridge the attack. This was effected in one case, in the practice of Dr. C. D. Meigs, by applying a cloth wrapped around ice over the epigastrium and the lower part of the sternum. The chief danger during the attack is from congestion of the brain, with effusion of serum or extravasation of blood. If the attack is severe, and the features congested, so that there is evident danger of such a result, cold applications should be made to the head, derivatives used for the extremities—as sinapisms, or mustard foot-baths—and the bowels should be speedily opened by enemata.

CHAPTER XIV.

CHOREA.

Chorea, or St. Vitus' or St. Guy's dance, is a nervous affection, which is characterized by irregular and involuntary muscular movements, without loss of consciousness. The movements occur in the muscles of volition, and there is probably no one of them that may not be engaged, though some are more frequently affected than others. It is not known that any involuntary muscle is ever involved, though Sir William Jenner has expressed the opinion that occasionally the papillary muscles of the heart are, so that, by their spasmodic contractions, they produce insufficiency of the mitral valve. This, according to him, affords explanation of the fact that, in certain instances, a mitral regurgitant murmur is heard, which disappears about the time that the external movements cease. It is rare, however, that a mitral regurgitant murmur, heard during chorea, ceases when the latter terminates, and it is not improbable that in such cases there is, after all, a lesion of the valve, due to recent endocarditis, whether of a rheumatic or other origin. For a valve may be so thickened by recent inflammation as to cause a murmur, and after a few weeks or months the infiltrating substance be so absorbed that the murmur is no longer audible. If we admit the fact that cardiac bruits occasionally appear and disappear with chorea, this explanation seems to me more plausible than that of Jenner. Hillier says, in reference to this subject: "My own experience leads me to doubt the existence of dynamic apex murmurs in chorea, that is to say, murmurs produced in hearts entirely free from organic change. If such murmurs ever occur, they are certainly rare. Organic murmurs of the heart, on the other hand, are common in chorea, and I am inclined to believe that organic disease of the heart often exists in chorea when there is no murmur." Hillier also calls attention to the fact that choreic movements are irregular; but a cardiac bruit occurring regularly and uniformly, if not due to organic disease, would require rhythmical contractions of the papillary muscles to produce it.

Age.—Chorea may occur at any period of life; but while it is comparatively rare at other ages, it is not infrequent in childhood. A large majority of cases are between the fifth year and puberty. Under the age of five years, the proportionate number diminishes as we approach the time of birth, and it is rarely observed in infants under one year. The youngest in the statistics of Hillier was three months.

In 1870, at the Out-door Department of Bellevue, a child was presented for treatment, who, the mother stated, had had chorea from birth. The choreic movements were no doubt observed very early in infancy, though the disease probably was not congenital. The following table exhibits the relative frequency of chorea at different ages during infancy and childhood:—

	6 years and under.	6 to 10 years.	10 to 15 years.
Children's Hospital, London, Hillier	81	237	104[1]
M. Rufz	10	61	118
Out-door Department, Bellevue	2	26	16

M. Sée collected the statistics of 531 cases occurring in the Children's Hospital, Paris, and from them concludes that the maximum frequency of chorea is between the sixth and tenth years. Only twenty-eight of his cases were under six years, the remainder, 503, occurring between the sixth year and puberty.

Causes.—The profession are nearly agreed in regard to certain causes of chorea, while there is a diversity of opinion in reference to others. It is admitted that in a large proportion of cases there is a neuropathic state, which antedates and predisposes to chorea. This state is often manifested in the family history by a proneness to affections of the nervous system, and in the individual by a highly excitable state of the emotions, so that he evinces joy, grief, or anger, from slight causes.

All writers admit that there is often an inherited predisposition to chorea. In 27 of 48 cases of chorea, Radcliffe found that father, mother, brother, or sister had been or was the subject of one or other of the following disorders: paralysis, epilepsy, apoplexy, hysteria, or insanity. The children of parents who when young had chorea, or who exhibit proneness to ailments of the nervous system, are more liable to chorea than other children. Hence the fact sometimes observed, of different children in the same family becoming affected with chorea when they attain the age at which this disease ordinarily occurs. In one family, in my practice, three girls at different times were affected.

---

[1] None over 12 years admitted.

Sex.—The emotions are strong in girls, since in them the nervous system predominates, while the muscular power is weaker than in boys. Hence a partial explanation of the fact which statistics fully establish, that the proportion of choreic boys to girls is about in the ratio of one to two and a fraction. I have remarked, in this city, the large proportion of cases in school-girls between the ages of six and twelve years; the severe discipline and confinement of the public schools no doubt increasing the strength of the emotions, and weakening the control of the will over the muscles.

Proportion of Males to Females.

27	to	73.	Hughes' Digest of Cases in Guy's Hosp., 1846.
138	to	393.	M. Sée.
25	to	40.	Out-door Department, Bellevue.
276	to	499.	Children's Hosp., Lond. West (Lumleian Lect.).
466	to	1005	= 1 to 2.15.

Uterine Irritation.—The peculiar changes occurring in the female at puberty constitute an important cause. Hence another reason of the excess of female cases. Dysmenorrhœa and pregnancy are causes of a large proportion of cases in the first years of puberty. In the male, on the other hand, the changes of puberty do not appear to increase the liability to the disease, directly or indirectly, and male cases, after the age of twelve years, are comparatively rare. Radcliffe states (*Reynolds' System of Med.*) that after the ninth year, females are more liable to chorea than males, in the proportion of 5 to 2; while before the ninth year, the two sexes are equally liable to it. Carefully prepared statistics, however, notwithstanding the high authority of Radcliffe, show a preponderance of girls under the age of nine years, though not as great as over that age. In the Out-door Department at Bellevue, of 35 patients under the age of ten years, 22 were girls, while of 20 from the age of ten years to sixteen, 15 were girls.

According to West (Lumleian Lect.), in 775 children with chorea, under the age of ten years, treated in the Lond. Children's Hosp., 64 per cent. were girls.

Anæmia.—Among the most common predisposing causes of chorea is anæmia. It is present in so large a proportion of cases, exhibiting itself by pallor of the countenance and other characteristic signs, that medicines designed to improve the quality of the blood are among the most valued remedies. The peculiar neuropathic state already alluded to, which needs only a slight additional cause for the development of chorea, is, no doubt, largely dependent on impoverishment of the blood, if it is not sometimes due entirely to it. Among the poor of a large city like New York, or in hospital practice, the proportion of anæmic cases of chorea is, for obvious reasons, much larger than would appear from general statistics.

RHEUMATISM.—Dr. Copland, M. Bouteille, and afterwards M. Germain Sée, in a more extended monograph, directed the attention of the profession to rheumatism as a cause of chorea. Subsequent observations have established the fact that rheumatism, or the rheumatic diathesis, is so frequently present that it obviously sustains an important relation to chorea, though in what manner is not fully ascertained. This relation between the two is more frequently observed in some countries than in others. In England and France, so large a proportion of choreic patients present the history of rheumatism either in themselves or family, that certain physicians of these countries believe that rheumatism is the most common cause of the disease. In Germany, on the other hand, according to Romberg, in the majority of cases no relation can be traced between chorea and rheumatism, and the statistics of this city, and I think of this country, correspond with those in Germany.

Various theories have been promulgated in explanation of the relationship of the rheumatic and choreic diseases. It has been suggested that chorea is due to rheumatism of the brain or spinal cord. This is simply an hypothesis, the truth or falsity of which can only be ascertained by carefully conducted necropsies; but the theory appears improbable in view of all the facts. Another theory attributes chorea to the state of the blood which is present in those having rheumatism or the rheumatic diathesis, as well as in certain other conditions. This theory is enunciated by Dr. Ogle, as follows: "Recognizing the frequent existence of these fibrinous deposits or granulations on the heart's valves in chorea, I should be much inclined to look upon these post-mortem appearances rather as results of some antecedent general condition of the blood, common also to the choreic condition. It is very freely recognized that this affection is frequently, in some way or other, connected with that condition of blood which obtains in what we call anæmia, or that existing in rheumatic constitutions. In both of these states we know that the fibrin of the blood is much in excess (as also it is in pregnancy, another condition looked upon as obnoxious to chorea); and in these states we know that the fibrin with which the blood is surcharged is very prone to be readily precipitated, either owing to its superabundance, or from other obscure and acquired properties . . . upon the heart's walls or valves. May not this hyperinosis be the explanation of the coincidence alluded to?" (*British and Foreign Med.-Chir. Rev.*, January, 1868)—namely, the occurrence of chorea in those affected with rheumatism. Others still hold that chorea is the result of the heart disease, and not directly of rheumatism, occurring when the heart is affected from other causes, as well as when the lesion has a rheumatic origin. This theory is plausible, and probably to a certain extent correct. Heart lesions, observed in children, result from scarlet fever in a considerable proportion of cases, though, it is true, the endocarditis and pericarditis of scarlet fever are believed often to have a rheumatic origin, occurring; in some instances, from scarlatinous rheumatism, but in other cases from scarlatinous uræmia. Occasionally also the heart disease appears to have occurred independently of both rheumatism and scarlet fever. Thus in a fatal case of chorea with valvular disease, related to the Lond. Path. Soc., April 6, 1869, the child was always healthy up to the present illness (chorea), and there was no history of rheumatism in the family. The more observations accumulate, the more important does heart disease in itself appear as a cause of chorea. In nearly all recorded cases of fatal chorea, which were supposed to be due to rheumatism, and in which post-mortem examinations were made, vegetations have been discovered upon the valves—aortic or mitral. We shall see that certain eccentric causes of irritation aid in producing chorea, and may not the valvular disease, or the endocarditis which causes the valvular lesion, operate in a similar manner as a cause? We know that in the adult severe cardiac disease often profoundly affects the nervous system, perhaps in consequence of the irregular and embarrassed circulation; and certainly in the child a similar cause would be likely to produce a more decided effect.

But there is an ingenious theory which attributes chorea to minute emboli detached from vegetations on the valves, and arrested by capillaries in the corpora striata, or other portion of the cerebro-spinal axis. Since attention was directed to this matter, emboli have been found in one case in the medulla oblongata, although this portion of the spinal axis appeared healthy to the naked eye. Further observations are necessary in order to determine how much truth there is in this theory; but it seems probable, for reasons to be stated, that if capillary embolism does cause chorea, it is only in a limited number of cases, and that therefore those British observers who regard it as the common cause, have been led into error by the large proportion of choreic cases which are complicated by valvular lesions in their climate.

That embolism is not a common cause, if indeed a cause at all, appears probable from the following facts: First. In many cases of chorea there are no vegetations, or other appreciable lesion, which could give rise to emboli. Secondly. Most patients recover, and some speedily, by treatment, which we would not expect if the cause were embolism. Thirdly. Embolism is not infrequent in the cerebral vessels of the adult, without the occurrence of chorea. Indeed, the conditions which produce embolism are much more common in adults than in children, while the reverse is true as regards the liability to chorea. Fourthly. Dogs sometimes have chorea, but the injection of minutely divided fibrin or other substance in the veins of the dogs is not followed by chorea as one of the phenomena. Fifthly. Were capillary emboli the cause, we would expect to find an occasional embolus in the larger vessels of the brain, so as to be appreciable to the naked eye; but I find no examples of this in all the recorded autopsies which I have been able to consult. Moreover, it seems improbable that capillary embolism, when producing no lesion appreciable to the naked eye, would so arrest the circulation, and disturb the function of the brain or spinal cord, as to cause chorea, for the ill effects of such an obstruction would be likely to be obviated by the numerous anastomoses.

It is obviously better, in the present state of uncertainty regarding the exact relation of rheumatism and valvular disease to chorea, to postpone the acceptance of any theory till the minute anatomy of chorea has been as fully investigated as has its clinical history.

Fright.—A not infrequent exciting cause of chorea is sudden and profound emotion, especially fright. All statistics give fright as the cause of a certain proportion of cases, though there are usually other potential co-operating causes, as anæmia or valvular disease. Fright was stated as the cause of chorea in 31 of the 100 cases occurring in Guy's Hospital, reported by Hughes, or in nearly one in three. But the statistics of other observers do not give so large a proportion of cases originating in this way. Chorea may commence within a few hours after the fright, or not till the lapse of several days (eight or ten). If several weeks have passed since the fright, as in some reported cases, the chorea is probably due to other causes. In rare instances, chorea is said to have been caused by sudden and excessive joy.

IMITATION.—Under unusual circumstances, especially in a state of great mental excitement, imitation has been known to cause a form of chorea. Hecker describes an epidemic of it, occurring in the middle ages, and spreading through villages. In modern times it is rare that chorea originates from this cause, nevertheless occasional examples have been recorded.

But the disease which occurs from imitation differs from the ordinary form, and has been termed chorea major; while chorea proper, which is the subject of this article, is sometimes designated, in contradistinction, chorea minor.

In chorea major, the patient leaps, dances, or whirls like a top. It has its origin commonly in religious excitement, and spreads by imitation almost in the manner of an infectious disease. The epidemic of the middle ages was a chorea major. I have not been able to find any account of cases spreading by imitation, in modern times, which were not examples of the same form of chorea. Thus in the *Edin. Journ. of Med. and Surg.* for July, 1839, there is a clear description of chorea major, occurring successively in five children in the same family. Dr. Dewar, the attending physician, states that one of the children whom he was called to see was sitting near the fireplace, when her head dropped on her chest, and she appeared to doze some minutes. In the meantime the respiration became a little accelerated, the face altered and flushed, the eyes wild. In less than one minute she bounded from one extremity of the apartment to the other, leaping over chairs, a chest, and then throwing herself upon the floor; she attempted to stand upon her head, rolled upon the floor, and then, rising, ran with extreme swiftness in the room, till she finally fell again on the floor, where she remained motionless some minutes. Then, recovering, she noticed those who surrounded her, and asked of her sister a toy, which she had allowed to fall. The whole paroxysm lasted twenty minutes.

Obviously, the symptoms of chorea major differ materially from those of chorea proper, and it is a question whether it should have the same generic name. It is a curious and interesting disease in its psychical and pathological aspects, but it is so rare in modern times that a knowledge of it is of little practical importance.

INTESTINAL IRRITATION.—In rare instances intestinal worms cause
ea, though in these cases there have usually been some co-
ng causes. The following is an example, related by Mr.
d. Medico-Chir. Rev., Jan. 1868): Ellen L., 9 years old,
er treatment about a month with chorea, rheumatism,

and worms. She had not slept in four days, and there was constant spasmodic movement of the body and face. Her general condition was very unpromising. As she had passed portions of a tapeworm at intervals during the last three months, one drachm of the oleum filicis maris was administered in mucilage, which caused the expulsion of the entire worm. From that time she fully and rapidly recovered from the chorea, though a mitral murmur remained.

LESIONS OF BRAIN AND SPINAL CORD.—Nearly all standard authors who reject embolism as a cause of chorea, believe there is no anatomical cause of the disease located in the cerebro-spinal axis. In other words, they regard chorea as one of the neuroses. This view is probably, in the main, correct; but experiments, and also occasional cases, establish the fact that if not true chorea, at least choreiform movements, now and then result from a structural affection of the nervous centres.

Experiments on certain of the lower animals demonstrate that irregular muscular movements may be produced by traumatic injury of certain portions of the cerebro-spinal axis, as the corpora quadrigemina, crura cerebri, pons Varolii, crura cerebelli, thalami optici, parts of the medulla oblongata, and the upper portion of the spinal cord. Pressure on the projecting part of the medulla oblongata of an acephalous monster also causes convulsive movements. At the meeting of the N. Y. Acad. of Medicine, April 20, 1871, Prof. Post related the case of a child who was struck with a billet of wood, over the occiput, and chorea followed, due, in all probability, to the injury of the brain which resulted.

If irregular muscular movements, choreic or choreiform, result from traumatic injury of certain portions of the nervous centres, may they not also occasionally occur from lesions of the same parts produced by disease? Sir Benj. Brodie relates the case of a choreic girl, dying in St. George's Hospital (*London Lancet*, Dec. 19, 1840), in whom, after a careful post-mortem examination, the only morbid appearance observed was a tumor the size of a hazelnut, connected with the pineal gland. Dr. Broadbent described another case before the London Pathological Society (vol. xiii., page 246, *Transactions*), in which a tumor was found arising from the centre of the spinal cord; and Chambers one in which tubercles were imbedded in the cord. Romberg quotes from Frerichs a case in which the medulla oblongata was pressed upon by an enlarged odontoid process; and Dr. Aitken (*Glasgow Med. Journ.*, vol. i.) one in which the specific gravity of the thalamus opticus and corpus striatum was greater on one side than on the other. Rilliet and Barthez relate other similar cases, and add: "We may conclude, from these different cases, that there exist two species of chorea: the one essentially a simple neurosis, while the other depends on an alteration of the encephalo-rachidian system.. In a word, it is of chorea as of convulsions, that it is sometimes idiopathic, sometimes symptomatic." Still, the cases in which it is symptomatic are so few, that it is proper to consider chorea, as it ordinarily occurs, one of the neuroses until the microscope detects some anatomical cause in the cerebro-spinal system of which we are now ignorant.

Anatomical Characters.—So far as ascertained, chorea has no certain anatomical characters. As we have seen, lesions are sometimes present which probably sustain a causative relation to the disordered muscular action, and others are sometimes observed which are neither a cause nor result, their presence being a coincidence. But there are two lesions which, though often absent, have been observed in so large a proportion of fatal cases that they are justly regarded as an occasional result when chorea is severe. Dr. Hughes, of London, collected records of the post-mortem appearances of 14 cases, with the following result as regards the cerebro-spinal axis: Brain, 14 cases: healthy, 4 cases; only congested, 3 cases; softened in part or entirely, 6 cases (some of these also congested). In some of these cases those occasional results of congestion, namely, transudation of serum and extravasation of blood, in greater or less quantity, were also observed. Spinal cord: healthy, 3 cases; congested, 2 cases (one slightly, in the other the engorged vessels were large and numerous); softening in medulla oblongata, 1 case; softening opposite fourth and fifth vertebræ, 12 cases. In one there was soft, in another firm adhesion of the spinal meninges, and in one it is stated that the rachidian fluid was opaque. Of sixteen fatal cases of chorea occurring in St. George's Hospital, "congestion (more or less complete) of the nervous centres (brain or spinal cord, or both) was met with in six cases." There was softening of certain parts of the brain in one case, and of the spinal cord in another. (Ogle, *Brit. and For. Medico-Chir. Rev.*, Jan. 1868.) Other statistics of the anatomical character of fatal chorea correspond, in the main, with those of Hughes and Ogle. These lesions are probably not present in ordinary cases, occurring only when the choreic movements are so severe that the patient is deprived of needed repose, and the important functions of the economy, as the circulation and nutrition, are seriously disturbed.

The post-mortem examination of other parts besides the cerebro-spinal axis furnishes a negative result, if we except such affections as have been ascertained to act as causes of chorea. What portion of the nervous centre is chiefly involved in chorea is uncertain. Some, as Sir Benj. C. Brodie (*London Lancet*, Dec. 19, 1840), consider chorea a disease of the nervous system generally, while others have attributed it to disease or disorder of a certain part, as the corpus striatum, cerebellum, etc. Finally, it is stated that, in late experiments on choreic dogs, the movements do not cease when the spinal cord is severed from the brain, nor also on division of the posterior roots of the spinal nerves. (Legros et Onimus, Rech. sur les mouvements choreiformes du chien, Acad. des Sci., 9 Mai, 1870, *Lyons Med. Journ.*, June 5, 1870.) In these cases, therefore, the part of the axis which is in fault would appear to be solely the spinal cord.

SYMPTOMS.—Chorea is partial or general. It is partial when it affects a few muscles, or groups of muscles, as those of one arm, the face or neck, or of one eye. It is designated general, when all the limbs, and certain of the muscles of the face and trunk, are involved. Statistics show that partial chorea occurs more frequently on the left than on the right side, and in general chorea the movements on the left side are apt to predominate. The commencement is usually gradual. Even when finally chorea becomes general, certain muscles only are affected in the commencement in ordinary cases. The child in whom this disease is about to begin is observed to be fretful and impatient from slight causes, and the irregular muscular action at first is apt to be misunderstood by the parents, who reprimand him for his supposed fidgety habit. In exceptional instances, especially when the cause is a sudden and profound emotion, the commencement is abrupt, and the disease is severe and general from the first.

In a majority of cases the muscles which are primarily affected are those of the face, neck, fingers, or hand on the left side. Sydenham erred, unless the clinical history of chorea has changed during the last two centuries, when he stated as the common fact that a tottering gait is its first manifestation; but now and then such a case does occur. Wherever the choreic movements first appear, other muscles are soon involved, so that in the course of a few weeks, sometimes of a few days, all the muscles that participate are engaged.

A muscle affected by chorea alternately contracts and relaxes, but less forcibly and rapidly than in eclampsia, and the movement is partly controlled by volition. This produces an unsteady and tremulous action of the part, whether a limb, the neck, or face; which at once arrests attention, and indicates the nature of the disease. The result is similar, as regards the muscular action, whether the patient wills a movement, or attempts to control those which chorea produces.

If the case is of ordinary severity, the movements continue with but momentary intermissions, except during sleep, when they ordinarily cease. In grave cases patients are often deprived of the proper amount of sleep in consequence of the severity and persistence of the muscular action, and in exceptional instances, especially when the result is fatal, the movements continue in sleep, but the sleep is not sound, and is frequently interrupted. In profound sleep, the muscles are probably always in repose.

The older writers have left us graphic descriptions of those diseases which have striking external manifestations, though often with somewhat of exaggeration. Sydenham says of chorea: "The patient cannot keep it (his hand) a moment in the same place; whether he lay it upon his breast, or any other part of the body, do what he may, it will be jerked elsewhere convulsively. If any vessel filled with drink be put into his hand, before it reaches his mouth, he will exhibit a thousand gesticulations, like a mountebank. He holds the cup out straight, as if to move it to his mouth, but has his hand carried elsewhere by sudden jerks. Then perhaps he contrives to bring it to his mouth, and if so; he will drink the liquid off at a gulp, just as if he were trying to amuse the spectators by his antics!"

In severe general chorea a similar description is applicable to the movements of the legs and features. Grimaces and distortions of the features occur, while the gait is halting and unsteady, or it is impossible to walk, and the patient lies or sits. The speech is slow, thick, and indistinct, in consequence of the muscles of the tongue and larynx becoming engaged, and even mastication and deglutition are rendered difficult. The imperfect speech in chorea is attributed partly, however, to the impairment of the mental faculties. Chorea, except in mild cases, is accompanied by other symptoms referable to the nervous system. More or less impairment of the mental faculties occurs in severe and protracted chorea, exhibiting itself in dulness or apathy. The countenance sometimes presents in aggravated cases almost the appearance of idiocy. The muscles, instead of becoming hypertrophied, and more powerful by their frequent contraction, grow softer, more flabby, and weaker. Indeed, a partial paralysis sometimes results, so that a degree of numbness is experienced in the affected part, and the limb when raised cannot be sustained. Pain is not a symptom of chorea, but fugitive rheumatic or neuralgic pains are sometimes experienced. Derangement of the digestive function, exhibited by a poor or capricious appetite, constipation, etc., are common.

The urine of choreic patients has been examined by Drs. Walsh, Ford, Bence Jones, Handfield Jones, Radcliffe, and others, and its elements have been found in most cases to vary from their normal quantity. Dr. Handfield Jones read a paper before the Clinical Society of London, in 1871 (*London Lancet*, July, 1871), on two cases of chorea in which he had made careful chemical analysis of the urine, with the following result: During the height of the disease the amount of the urine was much in excess of what it was when the disease had ceased; the amount of urea excreted during the choreic period was enormous; the amount of phosphoric acid excreted when the choreic symptoms were at their maximum was excessive, but the quantity was less than the average during convalescence; a moderate amount of uric acid during the disease, but none upon recovery.

PROGNOSIS; COURSE.—Chorea, though obstinate and often incurable in adults, usually terminates favorably in children in three or four months. Bouchut considers its ordinary duration at from thirty to fifty days, which is certainly shorter than the average duration in this country, except as the disease is materially abridged by treatment. The same author states that it may continue only twenty-four hours, or some days, as he has observed in the convalescence from scarlet fever. But tremulousness of the muscles occurring in the state of weakness following a grave disease, and abating as the general health is restored, I should not consider as properly choreic, any more than that occurring from over-fatigue. As the choreic movements gradually increase in the initial period till a certain maximum is reached, so their decline is gradual. There are temporary variations also throughout the disease as regards the extent of the movement, which are aggravated by mental excitement, bodily fatigue, certain functional derangements, especially of digestion, and sometimes from causes which are not apparent.

Though, as a rule, chorea in children ordinarily terminates favorably under different, and even injurious, modes of treatment, there are exceptional cases. Romberg relates the history of a patient who died at the age of seventy-six years, having had chorea since the age of six years. In chorea limited to a few muscles, or duce physiological effects. Strychnia, when employed to the extent of causing some rigidity, is more efficient as a remedy, but smaller doses have been found useful.

Prof. Hammond (*Diseases of the Nervous System*, page 617) says: "My main reliance is on strychnia, which, I think should be given in gradually increasing doses, somewhat after the manner recommended by Trousseau. . . . This plan of treatment certainly shortens the duration of the disease very materially, and causes great improvement in the general health of the patient. Sometimes the effect is so well marked, and is so immediate, that it is not necessary to increase the doses to the extent of causing muscular cramps, but generally the full therapeutical effect of the drug is not obtained till the calf of the leg or the nucha has slight tonic spasm. I have never seen the slightest ill-consequence follow this mode of treatment, and the doses are increased so gradually that, with careful watching, danger need not be apprehended." Dr. Hammond has treated thirty-two children with this agent without a single failure.

But as chorea terminates favorably with smaller and safe doses, even if the time required is longer, it does not seem proper to recommend its employment to the extent of producing physiological effects for general practice. Bouchut, speaking upon this point, says: "But, with these precautions, strychnia is extremely dangerous, for I have seen, at the Hôpital des Enfants Malades, a young girl of thirteen years die in tetanus," produced by an increased dose of this drug (article on Chorea). Dr. West, in his Lumleian Lectures, also says: "I have seen one instance in which its employment, while it failed to benefit a somewhat severe case of chorea, was followed by two attacks of violent tetanic convulsions, which nearly proved fatal; " and he adds, " the twitching of the limbs of itself prevents our becoming aware of the dose being excessive, and a child's inability to describe its sensations deprives us of another." For such reasons, Dr. West does not favor the employment of this agent. Still, any agent may be given in an overdose, and it is not difficult to prescribe strychnia in a dose which will be efficient and yet safe for children at the age at which chorea ordinarily occurs. I have employed bromide of potassium in a few cases, but with so little benefit that I am not inclined to continue its use for this disease. Others have not been more successful. However efficacious the bromide may be in epilepsy, it does not appear to be a remedy for chorea.

Cimicifuga, first employed by Jesse Young of this country, is plain and unirritating. The various functions should be preserved so far as possible in their normal state. In exceptional instances, when the choreic movements are violent, the patient should lie in bed, and the muscular action, if so constant and excessive as to deprive him of the requisite sleep, should be restrained by light and well-padded splints.

Medicinal.—Sometimes among the co-operating causes is one of a local nature, which is susceptible of removal, as a carious and painful tooth, intestinal worms, etc., and measures calculated to effect this are obviously required. Allusion has already been made to a case in which the employment of the oleum filicis maris, and expulsion of a tapeworm, effected a speedy cure.

The remedy which has been most employed in chorea, and which in consequence of the anæmia is plainly indicated in a large proportion of cases, is iron. It does not interfere with the employment of other remedies which have a more specific effect. Nearly all the ferruginous preparations have been prescribed in different cases with benefit. Radcliffe, who justly ranks as one of the first authorities in nervous diseases, gives the preference to the iodide of iron, believing that iodine, as well as iron, exerts a curative influence. I have of late inclined to the use of the ammonio-citrate, as it is easy of administration in simple syrup, and is well tolerated.

Arsenic, highly extolled by Romberg and others, is a remedy of undoubted value. It is conveniently given in Fowler's solution. It should be administered in doses of three to five drops three times daily, after the meals, as in the treatment of cutaneous or other affections. Radcliffe has administered by subcutaneous injection Fowler's solution, diluted with an equal quantity of water, in a few cases of obstinate local chorea, with a satisfactory result. An adult with choreic movements in one side of the neck of nine years' duration was nearly cured by fourteen injections, employed at intervals of a few days, the quantity employed being increased gradually from three to fourteen minims of the solution. Another remedy of undoubted value is strychnia. Trousseau, who prescribed it in most cases, and highly extolled it, employed the following formula:—

℞. Strychniæ sulphat. gr. j.
Syr. simplic. ℥ijss. Misce.

A child of the ordinary age, say ten years, takes at first a teaspoonful twice or three times daily, at uniform intervals, and the dose is gradually and cautiously increased until it begins to produce physiological effects. Strychnia, when employed to the extent of causing some rigidity, is more efficient as a remedy, but smaller doses have been found useful.

Prof. Hammond (*Diseases of the Nervous System*, page 617) says: "My main reliance is on strychnia, which, I think should be given in gradually increasing doses, somewhat after the manner recommended by Trousseau. . . . This plan of treatment certainly shortens the duration of the disease very materially, and causes great improvement in the general health of the patient. Sometimes the effect is so well marked, and is so immediate, that it is not necessary to increase the doses to the extent of causing muscular cramps, but generally the full therapeutical effect of the drug is not obtained till the calf of the leg or the nucha has slight tonic spasm. I have never seen the slightest ill-consequence follow this mode of treatment, and the doses are increased so gradually that, with careful watching, danger need not be apprehended." Dr. Hammond has treated thirty-two children with this agent without a single failure.

But as chorea terminates favorably with smaller and safe doses, even if the time required is longer, it does not seem proper to recommend its employment to the extent of producing physiological effects for general practice. Bouchut, speaking upon this point, says: "But, with these precautions, strychnia is extremely dangerous, for I have seen, at the Hôpital des Enfants Malades, a young girl of thirteen years die in tetanus," produced by an increased dose of this drug (article on Chorea). Dr. West, in his Lumleian Lectures, also says: "I have seen one instance in which its employment, while it failed to benefit a somewhat severe case of chorea, was followed by two attacks of violent tetanic convulsions, which nearly proved fatal; " and he adds, " the twitching of the limbs of itself prevents our becoming aware of the dose being excessive, and a child's inability to describe its sensations deprives us of another." For such reasons, Dr. West does not favor the employment of this agent. Still, any agent may be given in an overdose, and it is not difficult to prescribe strychnia in a dose which will be efficient and yet safe for children at the age at which chorea ordinarily occurs. I have employed bromide of potassium in a few cases, but with so little benefit that I am not inclined to continue its use for this disease. Others have not been more successful. However efficacious the bromide may be in epilepsy, it does not appear to be a remedy for chorea.

Cimicifuga, first employed by Jesse Young of this country, is highly esteemed by Philadelphia physicians in the treatment of chorea. I have employed the fluid extract in doses of half a drachm, increased to one drachm, for a child from six to ten years of age, and though it benefits some cases, it has no appreciable effect either in moderating the movements or abridging the duration of others.

Ether, assafœtida, valerian, musk, the oxide and sulphide of zinc, turpentine, tartar emetic, opium, and numerous other remedies, have been recommended, and some of them have seemed useful in certain cases. In this city sulphate of zinc has been frequently employed as a remedy for chorea, and in gradually increasing doses till more than twenty grains were administered three times daily, but it has not appeared, so far as I have been able to ascertain, to exert any marked influence either on the severity or duration of the choreic movements. Justice, however, requires us to state that Dr. West, who has written most recently on the nervous disorders of children, thinks that it has been beneficial in certain cases in which he has employed it, and regards it on the whole as the best remedy.

Radcliffe, who has had ample experience in the treatment of nervous affections, writes: "In an ordinary case of chorea the plan of treatment which I have now adopted as a rule for some time is to give cod-liver oil, in conjunction with hypophosphite of soda, making the draught containing the latter salt the vehicle for the administration of the cod-liver oil." Sometimes camphor or the sesquicarbonate of ammonia is added. Of more than thirty cases treated in this way, the average duration was under three weeks. Radcliffe began to prescribe these remedies on theoretical grounds, believing that phosphorus and cod-liver oil were required to restore "nerve tone," and the result of this treatment has certainly been such as to commend it to the profession. To children he gives from five to eight grains of the hypophosphite of soda three times daily.

In those severe cases in which the choreic movements prevent the proper amount of sleep, a moderate dose of hydrate of chloral may occasionally be advantageously administered.

Electricity has been many times employed in the treatment of chorea, and though some, chiefly electricians, believe that it has a curative effect, others, and the majority, fail to see any material benefit from its use.

Cold general baths, the shower-bath, frictions along the spine, etc., have been employed; but the local treatment, which has so far been most successful, and which promises to supersede all others, consists in the application of ether spray over the spine. About two ounces of ether are employed at each sitting, the spray being applied from an atomizer up and down the whole length of the spine if the chorea is general. The operation, which occupies from ten to fifteen minutes, should be repeated daily or every second day. Although this mode of treatment is quite recent, a considerable number of cases have already been reported, in which the spray has apparently had a very decided effect in controlling the disease.

CHAPTER XV.

INFANTILE PARALYSIS.

Paralysis in young children, especially infants, is in most instances due to causes which seldom produce it in adults. The principal cause of it in the adult, namely, cerebral apoplexy, is indeed rare in children. Paralysis in children has the following recognized causes: 1st. A change in the blood, not fully understood, induced by certain grave diseases, as diphtheria, typhoid fever, measles, scarlet fever, etc. 2d. Reflex influence. The function of some part of the system is in some way disturbed, and paralysis occurs in certain muscles, may be at a distance from the cause, and it disappears when that cause is removed, unless it has continued too long. The only rational explanation is found in the fact of a continuous connection between the local causes and the paralyzed muscles through the afferent and efferent nerves, and the nervous centres. 3d. An anatomical alteration in the muscular fibres, the nerves and nervous centres remaining unaffected. This has been designated myogenic paralysis. This form of paralysis is probably often of a rheumatic nature. We see a similar disease in that form of facial paralysis of the adult which results from long exposure of the face to a cold wind. 4th. A cause seated in the nervous system, either congestion, hemorrhage, softening, or compression, whether from inflammatory products or other cause.

Paralysis occurring as a symptom, or sequel of some obvious local or general disease, as diphtheria, lesion of the nervous centres, etc., and which may occur at any age, need not detain us. It is described in connection with the primary diseases on which it depends. But there is a form of paralysis which in the present state of our knowledge we must consider an idiopathic disease, and which is peculiar to the first years of life, or is so rare at other periods that it is proper to regard it as strictly a disease of infancy and early childhood. It occurs between the ages of six months and three years.

SYMPTOMS.—The previous health of the patient is usually good. The paralysis does not always commence in the same manner. In some it begins abruptly, after sound sleep. The child goes to bed well, sleeps through the night, and awakens in the morning paralyzed. I have known it to occur in one instance after sleep in the middle of the day. In these cases there has sometimes been an exposure, before the sleep, to wind or rain, or from sitting upon a cold stone. In other and the majority of cases the paralysis is preceded by a very decided febrile movement, which comes on suddenly, without appreciable cause, and after a few days the power of motion is found to be lost in one or more of the limbs. There is no symptom during the febrile movement to indicate any affection of the brain: consciousness is retained, and there is no more headache or apparent liability to convulsions than occurs in other pathological states accompanied by an equal amount of fever. In whatever way the paralysis begins, it is at its maximum in the commencement. Occurring as by a stroke, the full extent of the paralytic state is exhibited at once, and so far as there is any subsequent change, it is an improvement, as regards the number of muscles affected, and the degree of the paralysis. Most frequently the paralysis affects one or both lower extremities. Occasionally one of the upper extremities is also paralyzed in addition to the lower, but paralysis of an upper extremity is less in degree, and disappears sooner, than that of the lower. The bladder and lower bowels remain unaffected, since only the muscles of volition are involved. Sensation is unimpaired in the affected limbs, and in the commencement there is even in some cases a state of hyperæsthesia (West). The febrile movement, which precedes and accompanies the paralysis in certain cases, gradually abates, and in a few days nothing abnormal remains except the loss of power in the affected muscles. These muscles are in a flaccid and relaxed state, so that the limb falls by its weight when unsupported, and they are usually free from pain. The number of muscles paralyzed varies greatly in different cases. Only one muscle or a single group of muscles may be affected, or, on the other hand, both the extensor and flexor muscles of two or more limbs. In the opinion of Mr.

Adams, the following table exhibits the groups of muscles and single muscles most frequently involved, and in the order stated.

Groups.

1. Extensors of toes, and flexors of the foot.
2. Extensors and supinators of the hand.
3. Extensors of leg, and with them usually the first group.

Single Muscles.

1. Extensor longus digitorum of toes.
2. Tibialis anticus.
3. Deltoid.
4. Sterno-mastoid.

PROGNOSIS—PROGRESS.—The paralysis in nearly all cases soon begins to abate. The power of motion returns little by little, and whatever improvement occurs is permanent. There is no retrogression in the convalescence. The sooner improvement commences, the more favorable is the prognosis. In the most favorable cases there is complete restoration in from three to four weeks. In other patients, while certain of the muscles regain the power of motion, other muscles, oftener those of the lower extremity than upper, do not recover their function, and, unless proper remedial measures are employed, and even with them in certain instances, atrophy soon commences. The temperature of the paralyzed limb falls three, five, or even eight degrees, and the amount of blood which circulates in it is diminished so that the pulse of the limb is feebler and its vessels smaller than in health. With the atrophy the contractility of the muscular fibres by the electric current diminishes, and in unfavorable cases after a time powerful induced and even primary currents have no appreciable effect. The nutrition of a paralyzed limb is always imperfect, and if the paralysis occur in a child, its growth is retarded. Therefore in cases of protracted or permanent infantile paralysis of one limb a disproportion occurs both in diameter and length between it and that on the opposite side. If the paralysis continue, the ligaments of the paralyzed limb become relaxed and lengthened. West mentions a case of paralysis of the deltoid in which the humero-scapular ligaments were so extended that the humerus dropped from the glenoid cavity, so as to increase the length of the limb three-fourths of an inch. In the paralysis of certain muscles of the lower extremity, and continuance of the contractile power in others, we have the conditions which give rise to club-feet, and accordingly this deformity is the common result of the paralysis when it is not cured.

ETIOLOGY.—Opportunity for post-mortem examinations seldom occurs, and what the exact pathological state is which causes the paralysis has not been fully ascertained. As most of the cases occur during the time of first dentition, it was long believed that this physiological process was the chief cause, and hence the term dental paralysis by which this disease was designated. It is now, however, generally admitted that the evolution of the teeth is not a direct cause, and can only operate as a cause by increasing the susceptibility of the nervous system. The brain and cerebral meninges may also be excluded as sustaining any causative relation to the paralysis. There is no symptom indicating that they are involved. The mind remains clear, and convulsions are no more frequent than in any other disease attended by an equal degree of febrile reaction.

Most of the highest authorities as regards diseases of the nervous system, attribute infantile paralysis to disease of the spine. If we accept this theory, certainly the cause of infantile paralysis must in many instances be one of the mildest of the pathological states of the nervous centres, since there are so many cases of speedy recovery. Spinal congestion is held by Radcliffe and others to be this pathological state. Still there are certain differences in the symptoms of spinal congestion as it ordinarily occurs, and those present in many cases of infantile paralysis. (See *St. Thomas's Hosp. Rep.*, 1870, Barwell.)

Another theory regards infantile paralysis as entirely a peripheral disease, resembling in many instances, both as regards origin and nature, facial paralysis as it occurs in adults from protracted exposure to cold. This theory is thus advocated and enunciated by Mr. Barwell: "I do not see how at all we can escape the conclusion that this paralysis is purely peripheral; a malady affecting the ultimate fibrillæ of distribution of the nerves among the muscular elements." . . . . "Its essence lies probably in some subtile derangement in relationship between the ultimate muscular and terminal nerve-fibres, perhaps from some inflammatory, perhaps from some chemical or nutrient charge." (*Ibid.*) This theory may not be broad enough to cover those cases in which the paralysis is extensive, as when both lower and upper extremities are involved, but the facts observed in certain cases do harmonize better with this theory than with that of a central origin, and I would ask whether in some instances, at least, the supposed hyperæsthesia which attends certain cases may not be a tenderness due to the anatomical change affecting the terminal nerve-fibres alluded to by Barwell. The following is an example of the class of cases which the symptoms indicate have a peripheral rather than central origin. A. K., German, female, aged three years four months, fleshy; had been in the habit of sitting on the ground near the house and on the door-sill. On July 2d, 1871, she had a sound sleep in the afternoon, having been entirely well previously, and awoke trembling and with a high fever at 3½ P.M. At 8 P.M., the febrile excitement continuing, general clonic convulsions occurred, lasting about ten minutes. At this time I was called to see her, and found the face flushed, surface hot, and pulse about one hundred and thirty. Consciousness returned after the convulsion. The intelligence was good, tongue moist and slightly furred, bowels rather constipated, and the urine was freely passed. The febrile excitement continued two days, when it gradually and entirely abated, but before it ceased paralysis of the left lower extremity was observed. No weight at first could be sustained upon this limb, and it hung powerless when we endeavored to make her walk. The attempt caused her to cry, as if in pain, and pressing upon the thigh, or moving it, had the same effect. The thigh of this limb did appear slightly swollen on inspection, but measurement did not indicate any notable enlargement. The difference in circumference was certainly not more than one-eighth to one-fourth of an inch. There was no appreciable increase of heat in the thigh over the general temperature of the body. Sensibility remained in every part of the limb, and the loss of power was not complete, for on the first day, as soon as the paralysis was observed, slight and imperfect movements could be produced by pinching the limb. In three weeks the use of the limb was fully restored, by mildly stimulating liniments, and simple medicines to regulate the bowels. It does not seem improbable that in the future, when the true pathology of this disease is revealed, we shall find that there are two forms of it, one having a centric origin, and the other an eccentric, cases like that described above being examples of the latter.

ANATOMICAL CHARACTERS.—All muscular fibres which are in a state of disuse, begin in a few weeks to atrophy, and undergo fatty degeneration. The transverse striæ in the primitive muscular fasciculus gradually disappear and are replaced by granules of fat, and later still by small oil globules. If we examine with the microscope the fibres from a muscle which has been a considerable time paralyzed, but which has still some electric contractility, we will find in places the striæ remaining, but numerous opaque granules of a fatty nature within the sarcolemma wherever the striæ are absent, and in other places, where the degeneration is most advanced, oil globules occur, always small. If the paralysis is more profound, the striæ have all disappeared. At a later stage, usually after some years in cases of complete and incurable paralysis, the fatty matter may be to a considerable extent absorbed, and the fibrous network of the muscle which remains presents a tendonous appearance. There is a great difference, however, in different cases, as regards the rapidity with which these changes occur. Hammond states that he found the striæ remaining in two cases after the lapse of more than four years of decided paralysis. The nerves of the paralyzed part also undergo atrophy.

Little can be said that is positive and satisfactory in reference to those anatomical changes, whether peripheral or centric, which are believed to cause the paralysis. As to the peripheral cause, nothing is known beyond conjecture. As to the spinal cause, several autopsies have been made of those, dying of various ages, who were paralyzed from infancy or childhood, but there has been no uniformity as regards the condition of the spinal cord or its meninges, and an examination of the records of these cases convinces me that most of them were examples of spinal disease, which may occur at any age, and not of the true infantile paralysis. Certain diseases of the spine in the child will give rise to paralysis as they do in the adult, but we should not regard a case as one of infantile paralysis unless it has the clinical history of that disease. Thus, writers have included in their description of the lesions of infantile paralysis a case reported by Berend, in which the celebrated Recklinghausen found tubercles in the spine. Another case, reported by Hutin, presented atrophy of the lower part of the spinal cord, but the paralysis, unlike that which we are describing, began at the age of seven years. The following are the chief lesions which have been found in reported cases: sclerosis of spinal cord (increase of its connective tissue, and more or less atrophy of the nervous substance by compression) (Laborde and others), cicatrix and clot (Hammond), spinal arachnitis, with thickening of meninges (Jaccoud), atrophy of anterior roots of spinal nerves (Longet), atrophy of lower part of spinal cord (Hutin), tubercles (Berend). Finally, Fleiss, Adams, and Rilliet and Barthez examined cases and found no lesions of the spine or spinal meninges.

It is obvious that the discovery of such varied lesions in the spinal cords of those who have been paralytic from childhood aids but little in elucidating the pathology of infantile paralysis. These observers have seen the lesions in spinal, whether they have or not in cases of true infantile paralysis, but it is to be observed that, tubercles excepted, these lesions have been such as would be likely to result from intense and continued congestion of the cord. Intense congestion may cause apoplexy, and congestion long continued often causes a subacute and chronic inflammation, among the results of which, in case of the spine, would probably be sclerosis and atrophy with thickening and opacity of the meninges. Or may not the atrophy be a result of the paralysis just as atrophy of the nerves occurs? But in order to determine the exact relation which the state of the spine sustains to infantile paralysis, accurate and minute examination of the spinal cord is required in those who have died of intercurrent diseases at an early period of the paralysis. The researches of J. Lockhart Clarke have demonstrated that the microscope may aid greatly in elucidating the cause and nature of obscure diseases of the nervous system. It has already, in his hands, revealed structural changes of the cerebro-spinal axis in certain affections, which without its aid would be considered neuroses. It cannot be doubted that it will yet contribute much to a better understanding of this disease.

Diagnosis.—This is easy as soon as the attention of the physician is directed to the state of the limbs. In a large proportion of cases the mother or nurse first observes the paralysis, and calls the attention of the physician to it. A knowledge and recollection of the facts in relation to infantile paralysis should lead the physician to examine the state of the limbs in all cases of great febrile excitement in young children, occurring without apparent cause.

Prognosis.—It may be confidently predicted, if the child is seen early, and correctly treated, that the paralysis will diminish, if it cannot be entirely cured. If the paralysis has continued a considerable time, and there is no electric contractility of the muscles, there is poor prospect of any improvement. The induced current will fail, sometimes, to cause muscular contraction, when the direct current may produce it; but if there is no response to the direct current, there is no therapeutic agent which can restore the use of the limb.

cases seen soon after the paralysis commences, and before the atrophy, the prognosis is most favorable, when there is voluntary motion, and improvement commences early.

In most instances, even when the paralysis has been mild, and of comparatively short duration, the limb, although its motion is fully restored, is for a long time weaker than the limb on the opposite side.

TREATMENT.—A physician called at the commencement of the paralysis should endeavor to remove every cause which might increase the irritability of the nervous system. It is proper to scarify the gums, if much swollen and tender from dentition, the bowels should be kept regular, worms, if present, expelled by appropriate medicines, and the diet be plain and unirritating. As the cause of the paralysis is in the commencement still operative, measures are appropriate which are calculated to remove it.

Local treatment is very important at all periods of the paralysis. In the first days a tepid hip-bath employed daily, with brisk friction of the surface, has a salutary effect. Stimulating embrocations along the spine, and upon the paralyzed limb, are appropriate also at an early date. Possibly, if there is a strong probability of spinal congestion, cold applied along the spine, by ether spray or otherwise, might be useful, but I am not aware that it has been employed in this disease. If the paralysis appear to have a central origin, ergot, the bromide and iodide of potassium, which may be administered variously combined, or singly, are the appropriate remedies for the first twelve or fourteen days. Administered every three or four hours in proper dose, they are the most effectual of all internal remedies for diminishing spinal congestion, and preventing effusion, and permanent structural change in the cord.

If the paralysis continue, or is not progressively diminishing, we should not delay more than two weeks from the commencement of the disease before employing appropriate measures to restore the use of the limbs, and prevent atrophy of the muscles. The expectant plan of treatment which is proper in many diseases of children is unsuited to this. Muscular atrophy may commence in three weeks, and the further it has advanced, the more difficult and tedious will be the cure. Therefore, by the close of the second week if the paralysis continue, or is not rapidly disappearing, iron as a tonic with strychnia should be prescribed. There is probably no better formula for the exhibition of these agents than the following from Prof. Hammond:—

℞. Strych. sulphat. gr. j;
Ferri pyrophosphat. ʒss;
Acidi phosphorici dilut. ℥ss;
Syr. zingib. ℥iijss. Misce.

One-third of a teaspoonful, or one-ninetieth of a grain of strychnia, is sufficient for a child of two years, administered three times daily. Hillier, Barwell, and others have employed subcutaneous injections of strychnia, with, it is stated, a good result. While in the first and second weeks the child has been allowed to remain quiet, he should now be encouraged to use his limbs. Frequent muscular contraction must, if possible, be produced, and the voluntary movements, when not totally lost, aid greatly in promoting the nutrition of the muscles and restoring their function. Immersing the limb for half an hour in water at a temperature of 110 or 115 degrees, rubbing the limb with a coarse towel, and kneading the muscles, aid also in restoring nutrition and tone to them.

But, fortunately, we have an invaluable agent in the subtle electrical fluid, which can be made to penetrate the muscles and cause their contraction when every other measure has failed. The induced current should be employed upon the limb every day, or second day, if it cause the muscles to act, but if the loss of power is of long standing, or complete, so that the induced current is not sufficiently powerful, the direct current should be used instead. It is not regarded as important which way the current passes, provided the muscles contract.

In a large proportion of cases a cure cannot be effected until the lapse of several months, so that the patience of the physician and friends may be put to the test; but if muscular atrophy can be prevented, and the limb kept at near the normal temperature, this mode of treatment will ordinarily in the end be successful. The primary affection which caused the paralysis will, with some exceptions, abate of itself, so that the state of the muscles and their nervous supply demand the whole attention. Observations show that by treatment perseveringly employed, fatty degeneration of the muscular fibres can not only be arrested, but the fat which has already been deposited within the sarcolemma may be absorbed, and the muscular striæ restored. In those cases in which it has been necessary to employ the direct current, the induced should be employed, whenever by the improvement of the case it is found sufficiently powerful.

CHAPTER XVI.

FACIAL PARALYSIS.

CAUSES.—Facial paralysis, in the new-born, commonly occurs from pressure of the blade of the forceps upon the portio dura, at a point external to the stylo-mastoid foramen. It may also occur in children of any age, as it is known to in the adult, from exposure of the face to a cold wind. The pressure of a tumor upon some part of the portio dura, or even of the fist of the child placed under the face during sleep, may cause it. It may also result from disease of the temporal bone, producing pressure on the nerve, as caries, periostitis, suppuration, or hemorrhage into the aquæductus Fallopii, and also from intra-cranial disease affecting the pons Varolii or the medulla oblongata.

SYMPTOMS.—The portio dura, which is a nerve of motion, supplies the muscles of the face, and therefore its loss of function is at once manifest in distortion of the features. The eye of the affected side remains open in consequence of paralysis of the orbicularis palpebrarum, the upper lid being raised by the levator muscle, which is not paralyzed, as its nerve is derived from the third pair. From the inability to wink, the eye becomes irritated by dust and constant exposure, and, in children old enough to have an abundant lachrymal secretion, the tears are apt to flow over the cheek. On account of the paralyzed and relaxed state of the facial muscles the mouth is drawn towards the healthy side, while the affected side presents a swollen appearance. Movement of the eyebrow and of the anterior portion of the scalp on the paralyzed side is also impossible, since the occipito-frontalis and corrugator supercilii are supplied by the portio dura. If the cause of the disease is located above the origin of the chorda tympani, the flow of saliva, and consequently the taste, on the affected side are impaired. If the injury is posterior to the gangliform enlargement, those symptoms are superadded which are due to paralysis of the petrosal nerves.

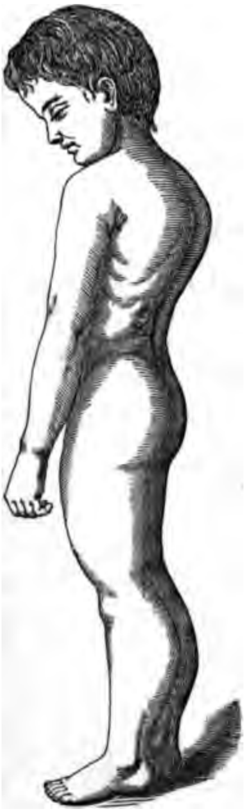
PROGNOSIS.—This depends on the cause. If the cause is peripheral, as from the pressure of the forceps or from cold, the prognosis is favorable. In cases of deep-seated lesion, unless syphilitic, the prognosis is usually unfavorable. A syphilitic lesion can often be removed by appropriate remedies and the paralysis cured.

TREATMENT.—In the paralysis of the new-born, from pressure of the forceps, all that is required is occasional rubbing or gentle kneading over the affected muscles. In those who are older, the nature of the cause, so far as ascertained, must determine the treatment. If there are glandular swellings, and discharge from the ear from scrofula, cod-liver oil and the syrup of the iodide of iron are required internally, with appropriate external treatment of the glands and ear. If syphilis is the cause, mercurials and the iodide of potassium should be employed. If the patient does not begin soon to improve, the treatment recommended for infantile paralysis, modified somewhat on account of the difference in location, is appropriate. Iron and strychnia may be administered internally; friction, kneading, hot applications, and the electric current employed. The current should have only moderate intensity, for a high degree of it might injure the vision. It should be applied every second day, with one pole over the mastoid foramen, and the other moved slowly over the muscles.

PARALYSIS WITH APPARENT HYPERTROPHY.

This is a rare disease. It was first described by Duchenne in 1861, and since the attention of the profession was directed to it, cases have been observed on the continent, in Great Britain, and this country. Though our acquaintance with this disease is so recent, it has been fully and accurately described by various writers in our language. The *Transactions of the Lond. Path. Soc.* for 1868 contain a translated paper relating to this disease, communicated by M. Duchenne, with photographic views, remarks by Lockhart Clarke, and also the histories of two cases occurring in London, and exhibited to the society by Adams and Hillier. In this country an elaborate paper has appeared on this form of paralysis, from the pen of Dr. Webber, of Boston, who succeeded in collecting the records of forty-one cases. (*Bost. Med. and Surg. Journ.*, Nov. 17, 1870,) Meigs, and Pepper, and Prof. Hammond have described this disease in their treatises, and the following wood-cut represents a case which occurred in the practice of the last gentleman, and which conveys a good idea of the appearance of one affected with this paralysis. In certain cases, however, as in one figured by Duchenne, there are still greater curvatures and enlargement than are represented in this wood-cut.

SYMPTOMS.—This disease in a considerable proportion of cases begins in infancy, and attention is first directed to it when the patient attains the age at which it begins to stand and walk, which is not ordinarily till some months later than the usual time. In eleven of the cases tabulated by Webber in which the disease had an early commencement, walking was impossible till between the ages of seventeen months and three years, and then it was in a clumsy manner. The gait, which is unsteady and waddling, has been compared to that of a duck. The child stands with the legs wide apart, and, from the unsteadiness of the gait, frequently stumbles and falls. It is admitted by those who have had the best opportunities to study the disease, that the muscular weakness commences before there is any appreciable enlargement. Therefore, if the disease begin after the child has walked, the peculiar clumsy gait attracts attention before there is anything in the appearance to indicate the nature of the disease.



The enlargement ordinarily occurs first in the calf of one leg, then in the opposite calf, and later in the thighs and hips. In Niemeyer's case, the muscles of the gluteal region were first affected. When the disease is fully developed, the spine is so incurvated that a perpendicular line from the most posterior of the spinous processes falls behind the sacrum. Duchenne attributes the curvatures to weakness of the erector muscles of the spine.

As the disease advances, the muscles of the trunk and upper extremities become involved, though the enlargement is less rapid and less in degree in these muscles than in those of the lower extremities. Finally, in advanced and severe cases walking is impossible, and the patient is obliged to remain in a reclining posture. Movements are now often painful, and distortions may occur on account of the loss of antagonism in the muscles. Experiments show that in some cases the electric contractility of the muscles remains nearly normal, while in other cases it is impaired. The skin retains its normal sensibility. The intellectual faculties are usually more o less impaired, especially in those cases which begin in early infancy. This disease is chronic, rarely terminating till after five or six years, and in many not till a considerably longer time.

ANATOMICAL CHARACTERS.—There have been so few post-mortem examinations of those who died having this disease, that it is still uncertain whether there is any centric lesion. Cohnheim examined the spinal cord in one case, and could find nothing abnormal. Recently, Mr. Kesteven has examined the brain and spinal cord from a case, and found dilatation of the perivascular canals, both in the brain and spinal cord, and also spots of granular degeneration chiefly in the white substance, "caused by loss of cerebral tissue replaced by morbid matter." (*Journ. of Mental Sci.*, Jan. 1871). As this child was imbecile, it is not improbable that these lesions were connected with the mental state, and not the muscular disease. It is probable, from the facts which have been observed, that the lesions of this paralysis are eccentric, or if central lesions occur, that they are consecutive and subordinate. As the disease consists in a sclerosis, or hyperplasia of the connective tissue surrounding the muscles, there is sufficient explanation of the paralysis in the impairment of function, and atrophy of muscular fibres, which such a hyperplasia would be likely to produce by its mechanical effect. Analogous examples will occur to the reader, of impairment or loss of function of internal organs, from hyperplasia of their connective tissue. Still, in those cases of this disease which have been observed from their commencement, weakness of the muscles has appeared before there was that degree of hyperplasia which produced any decided enlargement of the affected part.

The disuse of the muscles increases their atrophy, consequently in cases of this disease which have continued a considerable time, and are fully developed, the microscope shows not only atrophy of those muscles whose connective tissue have undergone hyperplasia, but also to a certain extent of those which are adjacent, and have a similar function, but are not the seat of the disease. The affected muscles present a pale yellowish hue, resembling, says Niemeyer, the appearance of lipoma. Examining by the microscope, we find in addition to a large increase in the fibrous tissue, and atrophy and in some places disappearance of the muscular element, more or less fatty matter, granular and globular, occupying the interstices. Mr. Kesteven describes as follows the appearance of the muscles in the case which he examined: "The muscular substance is pale, almost white, and very greasy. The superabundance of fat is evident to the naked eye. The muscular fibres present the ordinary striation, but less distinctly than usual. The ultimate fibres are pale, and separated by a large increase of areolar and fibrous tissue.

Causes.—These are obscure. Duchenne, in cases which he examined, could find no evidence of inherited taint or predisposition. Nevertheless, in several of the recorded cases one or more brothers or sisters were similarly affected, showing some latent cause in the family. In one case observed by Duchenne the disease appeared to be congenital, for at birth the limbs were unusually large, and the patient when he came under observation had never been able to walk. No relation has been observed between syphilis, scrofula, or other diathetic diseases, and this form of paralysis. Boys are more apt to be affected than girls. Of the cases embraced in the statistics of Dr. Webber, thirty-eight were boys and seven girls.

Prognosis.—This disease is in most instances progressive, terminating fatally after a variable period. It is in its nature chronic, rarely ending in less than five or six years, and a considerable proportion living longer, some even attaining adult age. The paralysis may be stationary for a time, but afterwards continue to increase. Duchenne has reported one case of recovery. In two or three other instances patients appeared to improve somewhat under treatment, but the writers admit they may have become worse afterwards. Death is apt to occur, not directly from the paralysis, but from some intercurrent disease, especially of the lungs.

Treatment.—The treatment thus far employed has been chiefly local, consisting in the use of electricity, and kneading or shampooing over the affected muscles. Both the primary and induced electrical currents have been employed, but, unfortunately, without any appreciable benefit in most cases. Benedikt, who claims a better result from electrization than any other observer, applie the copper pole over the lower cervical ganglion and the zinc pol along the side of the lumbar vertebræ by means of a broa metallic plate.

SECTION II.

DISEASES OF THE RESPIRATORY SYSTEM.

CHAPTER I.

CORYZA.

The term coryza is applied to inflammation of the Schneiderian membrane. It is acute or chronic. The acute form is primary or secondary. Acute primary coryza is common in infancy and childhood. Its usual cause is exposure to currents of air, to cold, and especially to sudden changes of temperature from warm to cold. The cause is the same as that in the ordinary forms of bronchitis. These two diseases frequently indeed coexist, occurring from the same exposure. The inflammation in such cases commences upon the Schneiderian membrane, immediately upon the operation of the cause, and soon after extends to the bronchial tubes. Acute coryza may also be produced by the inhalation of irritating vapors, hot air, or dust, and also by the presence of a foreign body, as a button or bean, in the nostril.

Secondary coryza is commonly due to a specific cause. The diseases in connection with which it occurs are hooping-cough, measles, scarlet fever, diphtheria, and constitutional syphilis. In the infant, coryza is one of the first manifestations of hereditary syphilitic taint.

Acute primary coryza ordinarily abates in from one to two weeks. The secondary form gradually declines, in most cases, when the primary affection on which it depends is cured. Syphilitic coryza is more protracted than the primary form, or than that accompanying the eruptive fevers. Some children are so liable to coryza that it occurs whenever they take cold. Occasionally it is so frequently renewed in the winter months, that it resembles the chronic form of the disease.

Chronic coryza is commonly dependent on a dyscrasia. It corshould be employed several times in the course of the day. Alum injections, four or five grains to the ounce of water, are also useful in a certain proportion of cases; or a solution of one of the mineral astringents may be employed, as liquor ferri subsulphatis, acetate of lead, sulphate of copper, or nitrate of silver. The bromine solution described in our remarks on the treatment of croup will also be found useful, injected into the nostrils.

In most cases of pseudo-membranous coryza constitutional measures are required, on account of the disease with which it is associated. In cases of acute simple coryza, and in the pseudo-membranous, inhalation, through the nostrils, of the vapor of hot water or of steam from hops often gives relief; occasionally it is an important part of the treatment. Syphilitic coryza requires those measures which are appropriate for constitutional syphilis.

Chronic coryza, dependent on a dyscrasia, is best treated by tonic and alterative remedies. The various ferruginous preparations, as wine of iron, tincture of the chloride of iron, iron lozenges, may be advantageously employed, or the vegetable tonics. If there are pallor, softness of flesh, and especially glandular swellings, indicating a scrofulous state of system, the syrup of the iodide of iron is useful, with or without cod-liver oil. The diet should be nutritious, and the hygienic measures such as invigorate the general health. Injections into the nostrils of a solution of alum, five grains to the ounce, of nitrate of silver, three to five grains to the ounce, or of one of the other mineral astringents, are sometimes useful in connection with constitutional measures. An excellent formula in chronic coryza, for application to parts which can be reached by a camel's-hair pencil, is the following:—

℞. Ung. hydrarg. ammoniat.,
Axungiæ, equal parts. Misce.

At the Out-door Department of Bellevue, this ointment, or the citrine diluted in the same proportion, has proved more effectual in this disease than any other local remedy. It should be applied three times daily, as far within the nostrils as possible.

Dr. J. F. Meigs, of Philadelphia, recommends the following ointment in chronic coryza, to be applied at night, after the use of injections through the day:—

℞. Unguenti hydrargyri nitratis ʒss;
Extracti belladonnæ gr. x;
Axungiæ ℥ss. Misce.

"It should be applied," says Dr. Meigs, "after being completely are apt to collect within the nostrils and around their orifice in chronic coryza, and sometimes also in the acute disease, if the discharge is not abundant. These crusts increase the difficulty of breathing. Often the acridity of the discharge is such that the skin of the upper lip, and around the nostrils, is excoriated.

PROGNOSIS.—Simple, uncomplicated coryza rarely terminates fatally. It is only dangerous in young nursing infants, in whom it may seriously interfere with lactation. Coryza, accompanying the eruptive fevers, although it may increase the suffering, does not materially increase the danger. Syphilitic coryza subsides when the system is sufficiently affected by anti-syphilitic remedies. Chronic coryza is sometimes very obstinate. It may continue for months or years, giving rise to a constant, but often not abundant, discharge.

TREATMENT.—Common mild attacks of coryza require little treatment. The bowels should be kept open, the feet soaked in mustard-water, and the body should be warmly clothed. Some benefit may be derived from friction with camphorated oil over the nose. If coryza commence with symptoms which indicate a pretty severe attack, and there are evidences of extension of the disease towards the bronchial tubes, an emetic of syrup of ipecacuanha, given at an early period, moderates the severity of the inflammation and may prevent the occurrence of bronchitis. Afterwards a simple diaphoretic mixture, as the following, should be given:—

℞. Syrupi ipecacuanhæ ʒij;
Spirit. æther. nitr. ʒj;
Syrupi simplicis ℥ij. Misce.

One teaspoonful every three hours to a child of six months. In place of sweet spirits of nitre, acetate of potash may be employed in the dose of one to two grains for infants; and if there is decided febrile reaction, from half a minim to two minims, according to the age, of tincture of digitalis, should be added to each dose.

In pseudo-membranous coryza the main treatment must be directed to the accompanying laryngitis, if, as is usual, the latter affection is present, since the coryza is much less dangerous than the other inflammation. Still, if it cause any obstruction to the respiration and increase the suffering of the patient, it requires attention. The frequent injection into the nostrils of a solution of chlorate of potash in water, with five or six drops of carbolic acid to each ounce, exerts a beneficial effect upon the inflammation, and aids in removing the accumulation of fibrin, mucus, and pus. It should be employed several times in the course of the day. Alum injections, four or five grains to the ounce of water, are also useful in a certain proportion of cases; or a solution of one of the mineral astringents may be employed, as liquor ferri subsulphatis, acetate of lead, sulphate of copper, or nitrate of silver. The bromine solution described in our remarks on the treatment of croup will also be found useful, injected into the nostrils.

In most cases of pseudo-membranous coryza constitutional measures are required, on account of the disease with which it is associated. In cases of acute simple coryza, and in the pseudo-membranous, inhalation, through the nostrils, of the vapor of hot water or of steam from hops often gives relief; occasionally it is an important part of the treatment. Syphilitic coryza requires those measures which are appropriate for constitutional syphilis.

Chronic coryza, dependent on a dyscrasia, is best treated by tonic and alterative remedies. The various ferruginous preparations, as wine of iron, tincture of the chloride of iron, iron lozenges, may be advantageously employed, or the vegetable tonics. If there are pallor, softness of flesh, and especially glandular swellings, indicating a scrofulous state of system, the syrup of the iodide of iron is useful, with or without cod-liver oil. The diet should be nutritious, and the hygienic measures such as invigorate the general health. Injections into the nostrils of a solution of alum, five grains to the ounce, of nitrate of silver, three to five grains to the ounce, or of one of the other mineral astringents, are sometimes useful in connection with constitutional measures. An excellent formula in chronic coryza, for application to parts which can be reached by a camel's-hair pencil, is the following:—

℞. Ung. hydrarg. ammoniat.,
Axungiæ, equal parts. Misce.

At the Out-door Department of Bellevue, this ointment, or the citrine diluted in the same proportion, has proved more effectual in this disease than any other local remedy. It should be applied three times daily, as far within the nostrils as possible.

Dr. J. F. Meigs, of Philadelphia, recommends the following ointment in chronic coryza, to be applied at night, after the use of injections through the day:—

℞. Unguenti hydrargyri nitratis ʒss;
Extracti belladonnæ gr. x;
Axungiæ ℥ss. Misce.

"It should be applied," says Dr. Meigs, "after being completely softened by a gentle heat, on a camel's-hair pencil, care being taken to apply it thoroughly to the surface of the mucous membrane itself, and not merely to the outside of the hardened scabs."

CHAPTER II.

SIMPLE LARYNGITIS.

SIMPLE acute laryngitis occurs at all ages, but it is so common in infancy and childhood that it is proper to treat of it in a work relating to the diseases of these periods. Like other inflammatory affections of the air-passage, it is most common in the cold months or when the weather is changeable. Its usual cause is, therefore, exposure to cold. Crying, protracted and violent, and the inhalation of acrid vapors, are occasionally causes. Simple or erythematous laryngitis also occurs in connection with certain other diseases, among which may be mentioned measles, scarlatina, and variola. In most cases of bronchitis, also, and in many of pneumonia, there is laryngitis, though its symptoms are, in great measure, obscured by those of the graver affection. More or less laryngitis is common in pharyngitis, due to extension of the inflammation.

SYMPTOMS.—Ordinarily, in cases of simple or erythematous laryngitis, produced by the impression of cold, coryza precedes and accompanies the attack. The first symptom is chilliness, followed by sneezing, and a discharge from the nostrils due to the coryza. The commencement of laryngitis is indicated by hoarseness, which is apparent when the child cries, or, if old enough, when he attempts to speak. There is, in severe cases, often complete loss of voice, so that the child cannot speak above a whisper. I have noticed this most frequently in the laryngitis which accompanies measles. Cough is also a common symptom of this disease. It is at first dry and husky, becoming loose in the course of a few days. But expectoration is scanty, except when the inflammation has extended to the trachea and bronchial tubes.

This disease is often accompanied by soreness of the throat, noticed in the act of coughing or when the larynx is pressed with the finger. In simple laryngitis, when uncomplicated, the respiration remains nearly natural and the pulse is but little accelerated. In mild cases the nature of the disease is often not apparent as long as the child remains quiet, in consequence of the absence of symptoms, but the character of the voice, when he cries or speaks, or of the cough, reveals at once the nature of the affection.

Simple acute laryngitis subsides in from one to two weeks. Occasionally it lasts three or four weeks before the symptoms entirely disappear. Death, which is rare, is due to some complication.

Chronic laryngitis is much less frequent than the acute form. Its anatomical characters are similar to those in other chronic inflammations affecting mucous surfaces, namely, thickening and more or less infiltration of the mucous membrane, increased proliferation and exfoliation of the epithelial cells, and increased functional activity of the muciparous follicles.

In the adult chronic laryngitis is common as one of the lesions of the syphilitic or tubercular disease. In the child this disease is more rare, but it sometimes occurs in connection with pulmonary or bronchial tubercles. Such patients are emaciated, and have the ordinary symptoms of tuberculosis. Chronic laryngitis also occurs in young children, usually infants, as one of the manifestations of the strumous diathesis. I have records of about twelve such cases, mostly nursing infants. Some of these patients had mild bronchitis, but it was obviously subordinate to the laryngitis. Their respiration was noisy and harsh, continuing of this character for several weeks and even months. The cough was also harsh and loud, conveying the idea of thickening and relaxation of the mucous membrane covering the vocal cords. Their respiration was not notably accelerated, and the blood was apparently fully oxygenated, though the friends were often alarmed by the noisy breathing and cough.

In this form of chronic laryngitis there is little expectoration, the fever is slight or absent, the appetite remains unimpaired, and the general condition of the child is good. There are from time to time exacerbations, and occasionally improvement is such as to encourage the hope of speedy cure, but in the cases which I have seen there has not been complete intermission in the disease till the final recovery. Those patients whom I have been able to follow through the disease have recovered in from three or four months to one year.

This chronic laryngitis is to be distinguished from frequent attacks of acute laryngitis, which are due to fresh exposures, and are accompanied by the ordinary symptoms of the acute disease. It is to be distinguished from protracted acute laryngitis, which sometimes does not entirely subside in less than a month or six weeks, by its longer duration, the greater thickening of the inflamed membrane, and more noisy respiration. Certain cases of chronic laryngitis result from the acute disease, the inflammation being perpetuated by the struma or dyscrasia of the patients.

ANATOMICAL CHARACTERS.—In simple acute laryngitis the mucous membrane of the larynx presents the usual appearance of mucous surfaces when inflamed, namely, redness and thickening. It is also somewhat softened. Ulcerations rarely, perhaps never, occur in primary acute laryngitis. When present in chronic laryngitis, the ulcers are small and situated upon or near the vocal cords. Tubercular and syphilitic ulcers of the larynx are much more rare in children than adults. The inflammation in simple acute laryngitis usually extends over the whole surface of the larynx, and also to the upper part of the trachea. It may be pretty uniform, or more intense in one place than another, and, like other mucous inflammations, it is accompanied by more or less rapid proliferation and exfoliation of epithelial cells. In most cases of simple laryngitis, whether acute or chronic, the inflammation extends to the pharynx, producing redness and thickening, though generally moderate, of the mucous membrane which covers it. Examination of the fauces therefore aids in diagnosis.

In the adult œdema glottidis occasionally results from laryngitis. In the child there is little danger that this will occur, in consequence of the anatomical character of the larynx. In early life there is but little submucous connective tissue in the larynx, and therefore less submucous infiltration or effusion during the inflammation. The structural changes occurring in simple laryngitis of infancy and childhood relate almost exclusively to the mucous membrane.

TREATMENT.—Simple primary and uncomplicated laryngitis requires little treatment. Most cases would do well by the employment of suitable hygienic measures, without medicines. Benefit is, however, derived from the use of demulcent drinks and an occasional laxative. A mixture of paregoric and syrup of ipecacuanha, or a small Dover's powder, will relieve the cough if it is troublesome. If there is restlessness, a warm mustard foot-bath is useful. An important part of the treatment is the application of some mild counter-irritant over the larynx. In most instances
mphorated oil, preceded perhaps by mustard, produces sufficient
ation. It should be rubbed several times daily over the throat,
rip of flannel soaked with it may be applied around the
hronic laryngitis dependent on syphilis or tuberculosis

requires the constitutional treatment which is appropriate for that disease. Local measures have but little effect upon this form of inflammation. The chronic laryngitis which I have described as occurring chiefly in infancy, and which appears to be of a strumous character, is apt to be obstinate. The patient should be warmly clothed, and constant care should be taken that there be no exposure which would endanger taking cold, as this would inevitably produce an exacerbation of the disease, and counteract all that had been gained by remedial measures. This form of chronic laryngitis is most satisfactorily treated by the application of tincture of iodine upon the neck, directly over the larynx, and the internal use of cod-liver oil and the syrup of the iodide of iron. Little benefit results in this form of laryngitis from the usual expectorant remedies, as squills or senega.

Spasmodic Laryngitis.

This is a common disease. It is also called false croup, in contradistinction to true or pseudo-membranous croup, and, by some of the continental writers, stridulous angina or stridulous laryngitis. It should not be confounded with spasm of the glottis, which is a form of internal convulsions, and is not inflammatory. It occurs ordinarily between the ages of two and five years. It is commonly a sporadic affection, but Rilliet and Barthez state that "it is incontestable that it may prevail epidemically." They express this opinion, not from their own observations, but chiefly from those of Jurine, made in the commencement of the present century.

Causes.—Children in some families are more liable to false croup than in others, so that an hereditary tendency to it must be admitted. The exciting cause in most cases is exposure to cold. False croup is not uncommon in the commencement of measles. Narrowness of the rima glottidis, and an excitable state of the nervous system, both of which are common in early childhood, are predisposing causes.

Symptoms.—Spasmodic laryngitis is ordinarily preceded for a day or two by a slight cough and fever, by symptoms of mild coryza or catarrh, such as all children are liable to on taking cold. In exceptional cases these symptoms are absent, and the disease begins abruptly. Singularly, it commences n
night, after the first sleep, between
sleep is usually quiet and nat

loud, barking cough. There is great dyspnœa, and the respiration is harsh or whistling, on account of the narrowing of the chink of the glottis from the swelling and tension of the vocal cords. The face is flushed and indicative of suffering. The child cries, moves from one position to another, wishes to be held or carried, seeking in vain for relief. The skin is hot, pulse accelerated, the voice hoarse or even whispering. After a variable period, usually from half an hour to two or three—not more than half an hour with proper treatment—these symptoms abate. The patient is then somewhat exhausted, and falls asleep. The face is less flushed or even pallid, the heat abates, and the pulse is less accelerated. The cough, though less frequent, remains for a time barking or sonorous, and the respiration, though greatly relieved, is not at once entirely natural, but it gradually becomes so. Often there is no return of the spasmodic respiration and cough, but sometimes the attack is repeated once or more, especially during the subsequent nights. The symptoms vary greatly in intensity in different patients.

As the attack declines, the disease, losing its spasmodic character, becomes a simple inflammation. In some there is immediate return to perfect health, but oftener the inflammation extends not only into the trachea, but also into the larger bronchial tubes, and the disease is then a laryngo-bronchitis, which gradually subsides.

The termination is not always so favorable. Spasmodic laryngitis is, in exceptional instances, the precursor of other serious affections, which may prove fatal. It has been stated that measles often begins with spasmodic laryngitis. Bronchitis becoming capillary, may occur in connection with it, as may also pneumonia, and by either of these severe inflammations the prognosis may be rendered doubtful. There are a few cases on record in which it is believed that spasmodic laryngitis was of itself fatal. In some of these cases the dyspnœa was extreme and persistent, and was the cause of death. In a case reported by Rogery, on the other hand, the respiration became easy before death, and the pulse more and more frequent and feeble. Death apparently occurred from exhaustion. It is not improbable that, had careful post-mortem examinations been made, in those cases of spasmodic laryngitis which have ended fatally, other lesions would have been discovered besides those located in the larynx, perhaps tracheo-bronchitis, with an accumulation of mucus in the larynx, producing suffocation, or perhaps sometimes congestion of the brain or lungs and serous effusion.

ANATOMICAL CHARACTER; PATHOLOGY.—The opportunity does not often occur of determining the anatomical characters of spasmodic laryngitis. I have witnessed but one post-mortem examination. A little girl, nine years old, was taken on Friday night with cough and dyspnœa, indicating a pretty severe attack. The mother, acting through the advice of a friend, gave kerosene oil to her in considerable quantity. This was succeeded by obstinate vomiting and purging, which continued during Saturday and Sunday. Death occurred on Monday. At the autopsy we found uniform and intense injection throughout the whole extent of the larynx and trachea, and extending into the bronchial tubes. There was no pseudo-membrane on the inflamed surface, and but little mucus and pus. The solitary follicles of the intestines and Peyer's patches were tumefied. There was injection, in places, of the gastro-intestinal mucous membrane. The cause of death was obviously the diarrhœa, apparently of an inflammatory character, and probably produced by the kerosene oil. The condition of the mucous membrane of the larynx was that which is ordinarily present in spasmodic laryngitis, though in some cases in which post-mortem examinations have been made the evidences of laryngeal inflammation were slight. Guersant relates a case in which the surface of the larynx seemed to be nearly in its normal state. Death in cases of slight laryngitis is due to causes which are independent of the larynx. In Guersant's case there was tuberculosis.

There is, as has already been intimated, another and an important element besides the inflammation, in the pathology of spasmodic laryngitis—an element producing those phenomena which render it a disease distinct from simple laryngitis. I refer to spasm of the laryngeal muscles. This element pertains to the nervous system, so that spasmodic laryngitis is allied both to the neuroses and to the inflammations.

DIAGNOSIS.—The disease for which spasmodic laryngitis is most frequently mistaken is pseudo-membranous croup. The friends, indeed, usually make this mistake in forming their opinion of the case before the physician arrives; and there can be no doubt that many of the cases which physicians have published in medical journals as true croup were examples of this affection. The points of differential diagnosis are the following: True croup begins with symptoms which at first are slight, so as scarcely to arrest attention, but which gradually increase in intensity. The cough becomes more harsh, and the respiration more difficult, by degrees.

This increase in the gravity of the symptoms occurs by day as well as by night. On the other hand, false croup, though preceded by symptoms of coryza, or catarrh, begins abruptly. The symptoms have from the first their maximum intensity, and the time at which it commences is the night. Again, the cough in spasmodic laryngitis possesses a loud, sonorous character; while in true croup it is harsh or rough, from the presence of the membrane, and having, therefore, less fulness. The voice in spasmodic laryngitis may be hoarse, but it is not lost, or is lost only for a short time. It afterwards becomes natural, or is slightly hoarse. On the other hand, in true croup, the voice, from being natural at first, is gradually extinguished. In fatal cases it soon becomes whispering, and continues such till the close of life; in those that recover, the voice remains hoarse for several days. These differences are important, and, if fully appreciated, are in most instances sufficient to establish the diagnosis. Besides, in a large proportion of cases of true croup, portions of the pseudo-membrane may be discovered on inspecting the fauces, and the faucial surface is deeply injected, while in spasmodic laryngitis there is, with rare exceptions, no false membrane upon the surface of the fauces, and but a moderate amount of congestion.

Laryngismus stridulus, or internal convulsions, must not be confounded with this disease. It is not inflammatory, but purely spasmodic, suddenly commencing and abating—identical, it is believed, in character, with tonic convulsions of the external muscles, but affecting the internal muscles of respiration. This disease has already been fully described.

Prognosis.—Little need be added, as regards the prognosis, to what has already been stated. While a favorable opinion in reference to the result may ordinarily be expressed, the physician should not forget the fact that death may occur. Symptoms indicating an unfavorable termination are: great and continued dyspnœa, not diminished by the proper remedial measures; stridulous expiration as well as inspiration; lividity of the prolabia and fingers; pallor and coldness of surface; pulse progressively more frequent and feeble. Convulsions and coma may also occur near the close of life.

Treatment.—The indications of treatment are twofold: first, to relieve the spasmodic action of the laryngeal muscles; secondly, to cure the laryngitis. To meet the first indication, a warm bath of the temperature of about 100° should be employed as soon as possible after the commencement of the attack. The patient should be kept in it ten or fifteen minutes, in order to obtain its full relaxing effect. In mild cases a warm foot-bath may be sufficient. A second means is the use of an emetic, which should be simultaneous with the bath. To children under the age of three years, syrup of ipecacuanha should be given, in doses of one teaspoonful, repeated in twenty minutes, till vomiting occurs; or alum and syrup of ipecacuanha, two drachms of the former to one ounce of the latter, may be given in the same dose. The alum and the syrup produce more prompt emesis than the syrup alone. Children over the age of three years, unless of feeble constitutions, are best treated by the compound syrup of squills in teaspoonful doses, or a mixture of this with syrup of ipecacuanha. It is not often necessary to give more than three or four doses, and sometimes one or two are sufficient to produce vomiting.

In most cases, by the use of the warm bath and the emetic, the symptoms are rendered milder, and convalescence soon commences.

In the *American Journal of the Medical Sciences*, April, 1867, Dr. R. R. Livingston reports a case of laryngitis treated by Squibb's ether. It is stated that portions of pseudo-membrane, from one-eighth to three-fourths of an inch in length, were expectorated; but the symptoms certainly indicated a spasmodic element as decided as in spasmodic croup, and the benefit from the ether was apparently due to the relaxation of the laryngeal muscles which it produced. The treatment of the patient, who was two years old, was commenced by the administration by the mouth of half a teaspoonful of the ether, and followed by its inhalation. "In precisely eight minutes from the time the patient commenced the inhalation, the abnormal muscular exertion ceased; a general relaxation took place; the pulse (which had numbered 150) fell to 100." Ether, judiciously employed, will probably prove to be a useful remedial agent in spasmodic forms of laryngitis, whether or not it has any effect on pseudo-membranous formations. The same may be said of chloroform. A large majority of cases, however, recover speedily without its employment, by the other measures recommended.

To fulfil the second indication, namely, the cure of the inflammation, as well as to control the spasm of the laryngeal muscles, bloodletting has sometimes been resorted to. It is, however, so seldom required, that it may be almost discarded as a part of the treatment. In those of full habit, with strong pulse, if the measures already recommended should not give relief, one or two leeches might be advantageously applied to the top of the sternum; but, except in such cases, local bloodletting, and much less general, should not be resorted to.

Attention should always be given to the state of the bowels in spasmodic laryngitis. If they are not well open, a purgative should be administered. For those that are robust, and with considerable febrile movement, the saline cathartics are ordinarily preferable, as Rochelle salts, or a purgative dose of calomel may be administered. The cathartic should not be prescribed till the nausea from the emetic has subsided. By its derivative effect, it tends to diminish the laryngitis, and, in severe cases, it may obviate the need of depletion by leeches.

Inhalation of the vapor of hot water, and the application of a sinapism over the neck and upper part of the sternum, followed by an emollient poultice, are useful adjuvants to the treatment.

When the spasmodic element in the disease is relieved, the case becomes one of simple laryngitis, and the general plan of treatment recommended for that disease is proper for this. Small doses of ipecacuanha, or of one of the antimonial preparations, as the compound syrup of squills, not sufficient to cause nausea, should now be given at regular intervals. I have sometimes added to the expectorant one drop of tincture of veratrum viride, for robust children over the age of three or four years, having a full and rapid pulse, flushed face, and other evidences of active febrile movement. Its effect should be watched, and it should be discontinued when its sedative influence on the circulation begins to be apparent. It should not be given in the spasmodic laryngitis which occurs in the commencement of measles.

If, however, there is not a speedy termination of the disease by recovery, or, more rarely, by death, there is nearly always tracheobronchitis, or a more serious affection, coexisting with the laryngitis, or following it; therefore, depressing measures should not be long continued. Expectorants of a stimulating character, as carbonate of ammonia, or syrup of senega, are required in the course of a few days, and in young and feeble children they should be given at an early period.

The mode of treatment recommended above is appropriate for that large class in whom the inflammatory element predominates. In a smaller number of cases the nervous element predominates over the inflammatory, and the treatment should be in some respects different. Such children are usually pallid and of spare habit, having, indeed, the nervous temperament. They are liable to attacks of this disease, though generally of a mild form, on slight exposure to cold, and with a very moderate amount of inflammation. The treatment in these cases should be directed more to the nervous system. My plan has been, in the treatment of such cases, after perhaps the use of a mild emetic, to give quinine, one grain three or four times daily, to a child from three to five years old, prescribing at the same time a simple expectorant, as syrup of squills, and a mildly irritating application to the throat. The symptoms in these cases are not severe, and active measures are not required, though the peculiar cough continues longer than in the more inflammatory forms of the disease.

The patient with spasmodic laryngitis should be kept in a warm room during the paroxysms, and should inhale an atmosphere loaded with moisture.

Trousseau recommends a mode of treatment of spasmodic laryngitis which was first suggested by Graves, of Dublin. It consists in the application underneath the chin, so as to cover the larynx, of a sponge soaked in water as hot as can be borne; in ten or fifteen minutes it is repeated. This reddens the skin, producing revulsion from the larynx. The hoarseness, dyspnœa, and cough diminish with this treatment, and some recover without other measures.

Guersant and others speak of the importance of prophylactic management of children who are liable to this disease. Attention should be given to the dress, so that there may be sufficient protection from changes of temperature, and there should be an equable temperature of the apartments in which they reside. Children of a decidedly nervous temperament, in whom the slightest laryngitis is apt to be spasmodic, require additional prophylactic measures. They are pallid, and in a more or less cachectic state. Such children are benefited by chalybeate and vegetable tonics, and by exercise in suitable weather in the open air.

CHAPTER III.

PSEUDO-MEMBRANOUS LARYNGITIS.

THE term pseudo-membranous laryngitis, or true croup, is applied to a common and fatal disease, the essential anatomical character of which is inflammation of the mucous membrane of the larynx, with the formation upon its surface of a pseudo-membrane. It occurs most frequently between the ages of two and seven years. It is rare in adult life, and also under the age of six months.

CAUSES.—There is greater liability to this disease in some children than in others, and occasionally the predisposition to it appears to be inherited. The common exciting cause is exposure to cold. Those children, especially, are liable to croup, who live in heated apartments, and are taken into the open air without proper covering, and those who a part of the time are warmly and a part of the time thinly clothed, especially as regards the covering of the neck. This disease is common among the poor of New York, who live in close rooms, overheated through the day and cool at night. Another less common cause is the inhalation of irritating vapors, or swallowing irritating or corrosive liquids. I have known a child to die from swallowing acetic acid, and another from scalding water, both having the dyspnœa and cough of true croup.

This disease is ordinarily primary, but occasionally it is secondary. The secondary form is not unusual in the declining period of measles, and it is an occasional complication of scarlet fever. Croup is most common in the winter months, and in times of changeable weather. It is said, also, that it sometimes occurs as an epidemic, but it is a question whether the supposed epidemics may not have been diphtheritic.

ANATOMICAL CHARACTERS.—The inflammatory action in this disease affects not only the mucous membrane, but, in a certain proportion of cases, extends to the submucous connective tissue, causing infiltration or œdema. The mucous membrane itself undergoes similar alteration to that in simple or spasmodic laryngitis, consisting of hyperæmia and thickening, proliferation, and rapid desquamation of its epithelial cells, and an abundant production of muco-pus. Sometimes the redness is found only in patches at the autopsy; in other cases it extends over the whole surface of the larynx, while occasionally it has disappeared so that the laryngeal mucous membrane, though thickened and softened, presents nearly its normal color. In all except the mildest cases the inflammation extends further than the larynx, involving not only the surface of the pharynx, but also in greater or less degree that of the trachea and bronchial tubes.

The distinguishing feature as regards the anatomical character of this disease remains to be noticed, namely, the false membrane which covers the laryngeal and often contiguous surfaces. This has long been considered as consisting of fibrin, which, exuding in its liquid state from the submucous vessels, became fibrillated when exposed to the air, its interstices being filled with a greater or less amount of pus, epithelial cells, and amorphous matter. At a recent date Wagner has surprised pathologists by the statement that these pseudo-membranes contain no fibrin, but that they consist of epithelial cells, which, undergoing some form of degeneration as they are pushed forward from the mucous surface, enlarge, and appear under the microscope as irregular blocks interlacing with each other. By employing the picro-carminate of ammonia, or a weak ammoniacal solution of carmine, Weber and other microscopists have been able to trace the boundaries of these irregular and interlacing blocks, which have prolongations like the shape of a stag's horns, and they have observed the intermediate forms of transition between these and the normal epithelial cells.

The views of Wagner are now generally admitted to be in the main correct as regards the pseudo-membrane of croup, but some of the highest authorities in pathological histology, as Rindfleisch, state that they find fibrin in the pseudo-membrane, in addition to the enlarged and degenerated epithelial cells of which it is chiefly composed. Rindfleisch says: "The pseudo-membrane is of a peculiarly stratified structure, since upon a layer of cells at tolerably equal distances there always follows a layer of fibrin, and this sequence is repeated from one to ten times, according to the thickness of the membrane." (*Patholog. Histol.*, translated, page 351.) As lending support to the views that the pseudo-membrane does contain fibrin, the fact may be stated, that while in the ordinary pneumonia of young children there is no fibrinous exudation in the air-cells, this exudation does occur, at least in a certain proportion of cases, in pneumonia occurring as a complication of croup. Thus, recently in this city, in a pneumonic lung from a case of fatal croup, occurring at the age of about two years, Dr. Francis Delafield found fibrin in the exudat of the air-cells. The exact nature of the degeneration which the epithelial cells undergo is unknown. It is generally believed that they are infiltrated by an albuminate, but Weber holds the opinion that the substance is fibrin. MM. Cornil and Ranvier, on the other hand, state: "We have verified the correctness of the description given by Wagner; we have separated and colored the cells by means of the picro-carminate of ammonia, and, in consequence of the facility which they present of fixing the carmine, we conclude that they are not filled with fibrin, but rather by a matter resembl

These exudats of true croup are

proportion as the globules of pus or new epithelial cells are produced underneath them." The pseudo-membrane varies greatly in amount in different cases. It may occur only in points or small patches, which are generally found in the vicinity of the vocal cords, while in other cases it extends an almost continuous membrane from the epiglottis into the bronchial tubes, and there is every gradation between these two extremes. It fills the orifices of the muciparous follicles, and the minute depressions upon the mucous surface, being closely adherent, so as not to be detached by efforts of coughing or vomiting, except in small portions.

As the inflammation commonly extends beyond the larynx, so the pseudo-membrane, in a large proportion of cases, is formed not only upon the laryngeal, but also upon contiguous surfaces. In thirty-three cases of true croup, comprised in the statistics of Dr. Ware, of Boston, pseudo-membranous pharyngitis was also present in all but one; and in nineteen cases observed by Dr. Meigs, of Philadelphia, in all but three. The formation of a pseudo-membrane in the trachea in connection with that in the larynx is also common, and it is not infrequent in the bronchial tubes. M. Guersant has, so far as I am aware, collected the largest number of records relating to the extent of the pseudo-membrane in true croup. In an aggregate of 120 cases it was confined to the larynx and trachea in 78, or about two-thirds, while in the remainder, namely, 42, it extended into the bronchial tubes.

In those whose systems are robust, the false membrane is usually firmer than in those whose systems are reduced. In a state of decided cachexia it is sometimes friable and easily detached. If the case continues from four to six days, it begins to soften from commencing decomposition, the minute fibres which attach it to the mucous membrane give way, and, in favorable cases, by the effort of coughing or vomiting it is thrown off. Separation is aided by muco-pus, which collects underneath. In fatal cases the false membrane, if detached by the efforts of the child, is rapidly reproduced, so that in twelve to eighteen hours the dyspnœa returns. Pneumonia not infrequently complicates croup. In extreme cases, in which inspiration is difficult in consequence of the obstruction, the lungs are only partially inflated, and imperfect decarbonization of the blood and sometimes collapse of certain pulmonary lobules are the result. Occasionally there is that degree of thickening of the mucous membrane, and submucous infiltration, that the dyspnœa and danger occur more from these than from the presence of the pseudo-membrane.

SYMPTOMS.—In some cases, pseudo-membranous, like simple laryngitis, is preceded by coryza and pharyngitis, while in others laryngitis is present from the first. The commencement of croup is indicated not only by fever, diminished appetite, thirst, and such symptoms as accompany all acute inflammations, but by certain other symptoms which serve to distinguish this from all other diseases.

The cough is one of the earliest symptoms which distinguish true croup from other laryngeal inflammations. It is hoarse or harsh; its character may be expressed by the term dry or suppressed. It differs from the cough of spasmodic laryngitis, which is less hoarse and more sonorous. It is much more frequent in some cases than in others; in many patients, towards the close of life, it nearly or quite ceases. Hoarseness of the voice is also one of the first and most constant symptoms, and it continues throughout. Towards the close of life the voice is usually lost, and the child expresses its thoughts in an indistinct whisper.

The amount of expectoration varies considerably in different patients, according to the presence or absence of bronchial inflammation. If the inflammation extends no lower than the upper part of the trachea, the sputum is scanty during the whole course of the disease. In ordinary cases it is scanty at first, then more abundant, and again more scanty if the case is fatal. The scantiness of the sputum towards the close of life is due not entirely to exhaustion of the patient, but in part to obstruction in the larynx above the mucus and pus. By vomiting a much larger quantity is expectorated than by the cough. Frequently small portions of pseudo-membrane are expectorated with the mucus and pus, and occasionally also larger masses, complete moulds, indeed, of the larynx, trachea, or even of the bronchial tubes.

The respiration is accelerated, but not so much as in pneumonia or capillary bronchitis. In the advanced stage it commonly becomes slower than at first. As the obstruction in the larynx increases, the respiration assumes more and more the character which has been designated abdominal; the infra-mammary region is depressed in each inspiratory act, while the larynx approaches the sternum, and the alæ nasi are dilated. Patients sometimes have painful attacks of dyspnœa, due to detachment of an edge of the pseudo-membrane, and its doubling upon itself. In the paroxysm, the sufferer throws himself from side to side in the bed, or reaches his arms to his mother or nurse for relief; his eyes are wild, features anxious, and, in severe paroxysms, fingers and prolabia livid. In the interval there is comparative quietude, though the respiration is constantly embarrassed.

The frequency of the pulse varies according to the extent of the inflammation and the stage of the disease. In the commencement of primary croup it ordinarily varies from about one hundred and ten to one hundred and twenty beats per minute. In the course of the disease it becomes more frequent, and towards the close of life feeble.

Now and then a patient presents a decided remission in symptoms, due to detachment of the adventitious layer, and the friends are apt to think that the danger is passed. Unfortunately the lull in symptoms is in most cases deceitful, as the cause of the dyspnœa is rapidly reproduced. I once attended a case in which there had been such dyspnœa that an unfavorable prognosis was given. An almost complete intermission, however, occurred in the symptoms, with the exception of the febrile movement, so that a physician who visited the patient at this time diagnosticated an essential fever. In a few hours, the pseudo-membrane being reproduced, the symptoms returned with greater violence than ever, and the child died. So complete an intermission seldom occurs in a fatal case; and in most patients, during the times of temporary improvement, there is still such dyspnœa, with the characteristic cough, that the nature of the disease is apparent.

If the stethoscope is applied over the larynx in true croup, the loud expiratory as well as inspiratory sound is heard as the air passes by the obstruction. This sound is often transmitted to every part of the chest, so as to obscure the râles which may be produced there. Auscultation over the chest reveals either the vesicular murmur, perhaps somewhat diminished in intensity, or more frequently the sonorous and afterwards moist râles due to coexisting bronchitis. In a limited number of cases, dulness on percussion is observed at some part of the chest, with bronchial respiration, indicating pneumonia. Recovery from croup is in most patients gradual; the voice becomes less hoarse, the cough looser, and the dyspnœa ceases by degrees. The structural changes which have occurred in the mucous membrane of the larynx do not disappear till several days after the last pseudo-membrane is detached.

Fatal cases may terminate in two or three days, but their ordinary duration is from five to fourteen days. Death may result directly from the thickness and firmness of the pseudo-membrane, which obstructs the entrance of air. Sudden death in a paroxysm of dyspnœa may occur from the detachment of one end of the pseudo-membrane, and its folding upon itself. In many patients, death is not due so much to obstruction to the entrance of air from the presence of the pseudo-membrane, as to the mucus and pus which collect in the trachea and bronchial tubes, and which are not expectorated on account of the presence of the pseudo-membrane and the feeble expiratory efforts of the child. In a case which was examined after death in the Nursery and Child's Hospital of this city, the false membrane was apparently not sufficient to produce a fatal result, but the air-passages below it were nearly filled with muco-purulent matter, which obstructed the entrance of air.

Pathological Characters.—This disease is then essentially a laryngitis presenting the lesions of a simple though usually severe mucous inflammation, but with a superadded element, namely, the false membrane. The coexistence of simple or pseudo-membranous pharyngitis, tracheitis, and bronchitis is also, as we have seen, common. The impediment to respiration, which renders croup so dangerous and fatal, is due not only to the presence of the false membrane, but to the mucus and pus which collect below it, and also to the inflammatory swelling of the mucous membrane and submucous œdema. In addition, there is a neuropathic element which increases the dyspnœa, and which most observers consider a spasmodic contraction of the laryngeal muscles induced by the inflammation, and hence the easier breathing in sleep, and in the general muscular relaxation, which precedes death. Prof. Jacobi (*Amer. Journ. of Obstet.*, etc., N. Y., May, 1868), however, holds that the state of these muscles is one of paralysis rather than spasmodic contraction. In his opinion, this paralysis "is secondary. It depends on the œdematous soaking of the posterior crico-arytenoid muscles following the œdema of the mucous membrane of the crico-arytenoid folds."

In several fatal cases which I have had an opportunity to examine after death, I have found the appearance of the lungs quite uniform. They were reduced in volume (semi-collapsed) and more or less congested. Certain parts distant from the bronchi, especially the edges and thin portions, were collapsed completely, and certain lobules also hepatized. I have also observed, though in some of the cases my attention was not directed to it, distension of the right cavities of the heart with blood, and large thrombi. From the nature of the disease, the blood is less oxygenated, and somewhat darker than in those who die of diseases not involving the respiratory apparatus.

DIAGNOSIS.—The diagnosis of true croup is ordinarily easy. It might be mistaken for spasmodic laryngitis, but more frequently spasmodic laryngitis is mistaken for it. The differences which will aid in differential diagnosis are the following: commencement abrupt and at night in one, gradual in the other; presence in one, absence in the other, of a pseudo-membrane upon the surface of the fauces; fragments of this membrane in the sputum in one; character of the cough; course of the disease growing gradually worse in one, in the other, with few exceptions, rapidly improving. Trousseau speaks of the liability to error of diagnosis in those cases in which spasmodic laryngitis is associated with pseudo-membranous pharyngitis. Few physicians hesitate to designate as true croup those cases in which there is a croupal cough in connection with false membrane upon the surface of the fauces, and yet the laryngitis under such circumstances may be merely spasmodic. This coexistence of pseudo-membranous pharyngeal and of spasmodic laryngeal inflammation is, however, probably rare, but its occasional occurrence should be borne in mind.

True croup is readily distinguished from laryngismus stridulus, or internal convulsions. Laryngismus stridulus is a purely nervous affection; it occurs suddenly, causing great dyspnœa, or momentary suspension of respiration, without the fever and without the hoarse voice and cough of croup. When muscular relaxation occurs, the attack ceases. The difference between the two diseases is therefore obvious.

PROGNOSIS.—The great mortality from true croup is universally known, and those physicians who report a large number of favorable cases have probably mistaken spasmodic croup for this disease. According to the statistics of Dr. Ware, nineteen out of twenty die; but with judicious treatment, commenced early, the mortality is probably less than this, though still great. Increase of dyspnœa, the voice and cough becoming more hoarse, and the pulse more accelerated, indicate a fatal form of the disease. Attention has already been called to temporary improvements which are apt to occur in croup, and lead to an error in prognosis. However, improvement continuing more than twelve hours is evidence of the decline of the disease.

The near approach of death is shown by lividity with great restlessness, or by pallor and somnolence. If the patient recover from croup, there often remains more or less bronchitis or broncho-pneumonia, which requires treatment, and the laryngitis when its pseudo-membranous character is lost, persists for a time, causing more or less hoarseness and acceleration of pulse.

TREATMENT.—The importance of early treatment in this disease has been sufficiently alluded to. If it has continued two or three days when first recognized, the chance of recovery is greatly diminished. As the danger in true croup arises from the presence of the pseudo-membrane, the indication is to prevent its formation, so far as possible, and to aid in its removal when formed.

Emetics have been and are still much prescribed in the treatment of this disease. Properly employed, they produce a good effect, but much harm has been done by their injudicious administration. As a rule, the depressing emetics should not be given except at the commencement of the disease, not later, indeed, than the second day, and not given at all if the patient is feeble or cachectic, or if the croup is secondary, as when it occurs in connection with measles or diphtheria. I have known death occur almost immediately after the administration of an antimonial emetic in the pseudo-membranous laryngitis accompanying diphtheria, when there was no urgent dyspnœa.

At the commencement of croup, ipecacuanha or tartrate of antimony and potassa may then be prescribed if the disease is primary, and the patient in good general condition; but if it is secondary, or the vital powers at all reduced, an emetic which is less depressing is preferable, as turpeth mineral or sulphate of copper. The emetic promotes the secretion of mucus, and a considerable quantity of this substance is usually found in the vomited matter, and it may also cause the detachment and expulsion of the softer portions of the pseudo-membrane. If the child in the initial stage of croup is under the age of three years, the syrup of ipecacuanha, with or without alum, may be administered in teaspoonful doses at intervals of ten or fifteen minutes till the emetic effect is produced, or if the age is above three years, the compound syrup of squills may be employed instead. But when assured that a pseudomembrane is forming, I prefer in most cases the sulphate of copper in one or two grain doses given in powder with an equal quantity of ipecacuanha, and repeated in ten minutes if the first dose does not produce the desired emetic effect. There is in most cases more or less relief of the symptoms after the emesis, though it may be but temporary. In one case recently in my practice, in which there was at the first visit considerable dyspnœa, distinct croupy cough, and a pseudo-membrane on both sides of the fauces, and in which

I had made an unfavorable prognosis, the parents observing the good effect of the first powder, repeated the medicine, contrary to directions, at intervals of about two hours, till my visit on the following day, and the patient recovered. Two or three powders are, however, ordinarily sufficient for this preliminary treatment. Turpeth mineral is not inferior in its effects to sulphate of copper, and many physicians of ample experience prefer it, given in doses of two or three grains. Prof. Fordyce Barker, of this city, who prescribes an emetic of turpeth mineral immediately on being summoned to a case, states that he has not lost a patient thus treated for many years. After prompt and efficient emesis is produced, other measures are required. We will speak hereafter of the further employment of emetics during the progress of croup.

Loss of blood is not required in the treatment of croup. The stronger cardiac sedatives, as aconite and veratrum viride, may occasionally be advantageously employed on the first and second days of primary croup. They should only be administered to those that are robust. They should not be prescribed after the pseudo-membrane is fully formed, nor in cases of secondary croup. Unfortunately the emetic treatment recommended above, and which must be considered preliminary, fails to arrest the disease in a large proportion of cases. It does seem to diminish the amount of false membrane in certain cases, and there is reason to think that it may even in some instances prevent its formation, so that the inflammation remains a simple laryngitis, though presenting in its commencement the characteristic symptoms of croup; but in other and a large proportion of cases the pseudo-membrane becomes fully formed, and continues to increase. The profession have been long looking for a remedy which, taken internally, may, by its effect upon the blood or the inflamed surface, prevent or diminish the membranous formation, and also for a remedy which, employed topically, may liquefy and remove it. The remedy which has been and still is most frequently prescribed for the first of these purposes is calomel. The ordinary ill-effects of this agent, namely, stomatitis and ptyalism, should not deter from its employment if it exerts any controlling influence over a disease so rapid and fatal as true croup. I am of opinion that it is useful unless there is that degree of impoverishment of the blood and cachexia which would contraindicate the continued use of any depressing agent. Calomel probably has no effect upon the false membrane; but it is to be recollected that there are other factors in the production of the dyspnœa which it is probable that calomel does aid in removing, whether by its derivative effect on the intestinal surface, or by some other mode of action not fully understood. Calomel is believed to be one of the most efficient agents, administered internally, for removing the thickening and infiltration of the laryngeal mucous membrane and the submucous œdema. I think that I have observed benefit from its employment, whether in a single dose of six to ten grains, or in small doses of one-fourth to one grain repeated several times in twenty-four hours. The calomel may be administered alone, or with ipecacuanha not in sufficient quantity to cause emesis, or in certain cases with Dover's powder. It may be given from two to four days, perhaps sometimes longer, when it should be followed by a mixture of chlorate of potassa or soda and muriate of ammonia given frequently. In cases in which the vital powers are reduced, especially in secondary croup, this mixture should be given from the first, in place of calomel. The chlorate has a solvent effect, though feeble, on pseudo-membranes, and as when taken into the system it is known to be eliminated in most of the secretions and excretions, it is not improbable that it escapes also from the surface of the larynx in the mucus, and therefore comes in contact with the membranous formation. The chlorates in frequent large doses sometimes cause salivation. Probably the effect of the muriate is subordinate, but it is believed by therapeutists to increase the mucopurulent secretion, and therefore diminish in some degree the turgescence of the mucous membrane. Cases in which there is marked and protracted dyspnœa and croupal cough do now and then recover with the use of chlorate of potassa or soda and muriate of ammonia, either employed after calomel, or without it as the main remedy from the commencement of the disease—so many, indeed, that it cannot be doubted that they do have some curative effect. The following formula may be employed for a child from three to five years of age:—

℞. Potas. chlorat. ʒj;
Ammon. muriat. ℈ij;
Syr. simplic. ℥j;
Aquæ ℥ij. Misce.

Dose, one to two teaspoonfuls every half hour or hourly, acc
ing to the urgency of the symptoms. This should be conti
regularly night and day until the cough becomes looser, or ur
is evident from the unfavorable nature of the case that it c
of no further service.

A very important part of the treatment is the inhalat
Some of our most experienced physicians consid

more useful than all other measures combined. In one of the most severe cases which I have met, which terminated favorably, the room was so filled with steam that water hung in drops from the ceiling. The atmosphere which the child breathes should be constantly loaded with moisture, without, however, that degree of heat which would add materially to the discomfort of the patient or attendants. Moist warm air coming in contact with the inflamed surface promotes expectoration and renders the cough looser. Steam may be readily produced by placing heated irons or bricks in a shallow pan or pail containing a little water, by pouring water upon a heated surface, or by a spirit-lamp or gas-jet under a pan of water. In order to avoid heating the entire room and to concentrate the vapor, the nurse may sit with the child under a frame covered with a blanket, and the steam be produced underneath.

A temperature of 75° or 80°, if the atmosphere is loaded with moisture, is more readily tolerated than a lower temperature with a dry atmosphere, and a temperature at least as high as 75° is required, or too much of the vapor is deposited. Of late, the inhalation of the spray of lime-water has been recommended, in the belief that it exerts a solvent effect upon the false membrane. The atomizer has been employed in order to produce the spray, but difficulty attends its use for children. It has been still more recently recommended to add to the water which is employed for the purpose of producing steam one or two lumps of quicklime, and allowing them to slake. The vapor by this means becomes impregnated with particles of lime. This last mode of employing lime may partially obviate the principal objection which has been raised against the use of steam in the treatment of croup, namely, that it necessitates confining the air, which soon becomes loaded with carbonic acid, since slaked lime, when moistened, rapidly absorbs this gas.

The employment of lime by inhalation in this disease certainly merits further trial, although, in the few cases in which I have employed it in both the ways stated above, I have observed no decided benefit from its use.

It has already been stated that depressing emetics should not be employed after the second day, but a period arrives in most cases when another class of emetics are required. They are required when the dyspnœa is urgent, as a means of removing from the air-passages the collection of mucus and pus and portions of false membrane which may be detached. Those emetics should now be prescribed which operate promptly with the least depression. Sulphate of copper is one of the best, if not the best, for this stage of croup, and it is usually employed by physicians. A child of five years may take one grain dissolved in a little water, and the dose be repeated if required in ten minutes. Sulphate of zinc or turpeth mineral may be used in the place of the copper. Dr. J. F. Meigs, of Philadelphia, prefers pulverized alum given in teaspoonful doses, but it is less efficient, and I am not aware that it possesses any advantages over the sulphate of copper. Whatever emetic is employed, its operation may be promoted by draughts of warm water.

It is to be recollected in the treatment of croup that the pseudomembrane, by commencing decomposition, and by the pus and mucus which collect underneath, is more easily detached after a few days, if the patient lives, than at first. Therefore the physician should endeavor to sustain the vital powers, in order that the cough may have sufficient force to separate this substance as soon as its fibres of attachment begin to loosen. A patient with croup rarely takes solid food, but he should be allowed beef-tea, milk, and farinaceous drinks at short intervals. If there are signs of exhaustion, alcoholic stimulants are proper, and fresh air should also be allowed so far as is compatible with the inhalation of steam.

While these general measures are employed, local treatment should not be neglected. The profession are not agreed as to the treatment either external or internal of the throat. As to external treatment, some recommend poultices, others cold applications, and others still, irritants. Professor Peaslee, of this city, in a series of papers on the pathology of croup, published in the *American Medical Monthly*, 1854, says of cold applied externally: "We consider this of the greatest value and importance. If cold applications are efficacious in all cases of external inflammation, they are scarcely less so here, where the inflamed surface is so nearly superficial. Cold must, however, be continuously applied to produce the desired effect. Applied at intervals, indeed, it rather promotes than retards the inflammatory process; since during the intervals the temperature rises above the normal standard, in consequence of the reaction of the chill on the surface. Cold water may be constantly dropped from a sponge upon a compress laid over the throat of the child; and the latter should be of only one or two thicknesses of linen, that evaporation may go on as rapidly as possible."

In ordinary cases cold applied over the larynx is preferable to poultices or warm applications. The sides of the neck should be kept warm by pieces of pork, or one or two thicknesses of flannel, while in the interspace in front, over the larynx, a compress of muslin or linen squeezed from ice-water should be applied every five or ten minutes. These may be retained in place by a single thickness of muslin passing around the neck, and cut narrow in front, in order to facilitate the applications of the compress. In place of the compress, a small quantity of crushed ice may be employed, surrounded by oil-silk to prevent dripping. This mode of applying cold I have found to be more convenient, on account of the frequent restlessness of the child, than that recommended by Prof. Peaslee. Cold is especially serviceable if the child is robust, with flushed cheeks and full and rapid pulse. In secondary croup, or croup occurring in feeble states of system, or presenting a subacute character, poultices or fomentations to the neck, with moderate irritation, may sometimes give most relief.

Topical treatment of the fauces and larynx has long been recommended in croup, and the agent which has been most frequently applied is nitrate of silver in solutions varying in strength from ten to forty grains to the ounce. It is applied once, twice, or several times daily. Nitrate of silver does not dissolve the pseudo-membranes, but it contracts those with which it comes in contact, and by the contraction aids in their detachment.

Great difficulty, however, attends the application of the probang to the larynx of the child, on account of his struggles and resistance, and it may well be doubted whether the most skilful operators usually succeed in applying it to the interior of this organ. But if the instrument is pressed against the aperture of the glottis, some of the liquid trickles from the sponge into the larynx, as is indicated by the severe coughing which it produces. Of late years three other substances have been used for topical treatment of the throat, which appear to be more effectual in removing the pseudomembrane and controlling the inflammation. One is liquor ferri subsulphatis, another carbolic acid, and the third bromine. The liquor ferri subsulphatis is best employed with glycerine in the proportion of one part to four.

℞. Liq. ferri subsulphatis ʒj;
Glycerinæ ℥ss. Misce.

Carbolic acid, in its crystalline or undiluted state, is an active caustic, with a tendency to spread. It should be used considerably diluted with water.

℞. Acid. carbolic. fʒss;
Aquæ ℥v. Misce.

Bromine has only recently been employed for topical treatment of pseudo-membranous inflammations. It is used in conjunction with bromide of potassium.

℞. Brominii ʒij;
Potass. bromid. gr. xiv;
Aquæ ℥j. Misce.

This is called the bromine solution, but it must be considerably diluted for use. Twenty-four to forty drops should be added to an ounce of water for application to the fauces or larynx. There are physicians who highly extol each of these three agents in the treatment of croup as well as diphtheria. They are probably all useful, though I cannot speak from personal observation in reference to the effect of bromine. They should be applied in the same manner as nitrate of silver, to which either one is probably preferable. Of the three agents, the one which I can highly recommend from personal experience for those cases which require this mode of treatment, is the subsulphate of iron. Local treatment, as recommended above, is obviously most useful in those cases in which there is decided inflammation of the faucial surface attended with patches of false membrane, or those cases in which the inflammation is first pharyngeal and becomes laryngeal by extension.

Unfortunately, as I have already stated, true croup, whatever the therapeutic treatment, is, in a large proportion of cases, a progressive disease. The hoarseness of the cough and voice and the dyspnœa gradually increase. The pulse, becoming more frequent and feeble, indicates the need of the most nutritious food, as the animal broths, and of alcoholic stimulants. The danger is, however, from the dyspnœa rather than asthenia. Medicine has failed to check the disease, and shall now the expedients of surgery be tried—shall tracheotomy be performed?

The published statistics relating to tracheotomy in croup are to a considerable extent unsatisfactory, since we are not informed, as regards most of them, at what stage of the disease the operation was performed, and what were the evidences of a fibrinous exudation. The most valuable and reliable statistics bearing upon this subject, so far as I am aware, are those published by Prof. Jacobi, of this city, in the *American Journal of Obstetrics*, etc., for May, 1868, and containing the results of the cases which were operated on by himself and Drs. Krackowizer and Voss. These gentlemen are known to the profession of New York as careful and judicious practitioners, not likely to operate when there was probability of success by therapeutic measures, and not likely to mistake simple or spasmodic laryngitis for true croup. I have tabulated the statistics of their operations:—

Age.	Number.	Recovered.	Died.
Under 2 years	8	1	7
From 2 to 3 years	29	5	24
" 3 to 4 "	26	4	22
" 4 to 5 "	34	11	23
" 5 to 6 "	9	2	7
" 6 to 7 "	1	1	0
" 7 to 8 "	3	0	3
10 "	1	0	1
Not given	55	15	40
	166	39	127

Time of death after operation.	Number of cases.	Time of Death after operation.	Number of cases.
Within 24 hours	19	On 5th day	9
On 2d day	7	" 6th "	4
" 3d "	16	" 7th "	2
" 4th "	15	" 9th "	1
		From 10th to 31st day	5
Total			78

The following were the causes of death, as given in the records of 73 cases:—

In operation	1	Pneumonia	5
Apnœa from too late operation	6	Broncho-pneumo. & pulm. gangrene	1
Apnœa	3	Pulmonary œdema	1
Anæmia and exhaustion	4	Pseudo-membranous bronchitis	18
Diphtheria	8	Tuberculosis	1
Bronchitis	6	Convulsions	2
Broncho-pneumonia	15	Emphysema	2
Total			73

The following table gives the result of tracheotomy in one hundred cases. It is prepared from the statistics of Güterbach, lately published:—

Age.	Result.
Under 1 year.	1 case fatal
Between 1 and 2 years	" "
" 2 and 3 "	33⅓ per cent. recovered.
" 3 and 4 "	40 " "
" 4 and 5 "	38 6/13 " "
" 5 and 6 "	44 4/9 " "
" 6 and 8 "	14 2/7 " "
" 8 and 9 "	25 " "

From conversations which I have had with surgeons of New York, I am persuaded that the above tables present a more favorable result than could be furnished by the general surgical practice of this city. Most New York surgeons, however, seem to shun the operation and regard it with ill-favor, and did they operate as frequently as those whose names I have mentioned, possibly the result would be better. Statistics in Paris probably give nearly the true proportion of successful and unsuccessful operations of tracheotomy for croup, as it is performed by skilful and careful surgeons. Of 388 cases occurring in the practice of several Parisian surgeons, 346 died and 42 recovered; while in the Hôpital Sainte Eugenie, of 374 operated on, 310 died. (Bouchut.)

The facts in reference to tracheotomy in croup are the following: The majority of those operated on do not recover, but some live who without the operation would die. The operation is now more successfully performed than formerly, as the conditions of successful operation are better understood. Those who have operated several times, confess that their last cases did better than their first. Trousseau's experience was striking and instructive in this respect. No one, probably, ever performed this operation for croup more times than he, and, from constantly greater success, he became more and more an advocate of the operation. Tracheotomy, if properly performed, does not in any case shorten life, but it frequently prolongs it several days. It diminishes greatly the dyspnœa, and renders death easy.

The objections to the operation are partly of a moral nature. The parents, already in the extreme of grief on account of the suffering and probable death of the child, consent with reluctance to an operation which promises not cure, but a prolongation of life. Common sympathy with the child and regard for the emotions of the parents should certainly have an influence in deciding for or against the operation. The first case of tracheotomy which I witnessed was such as, if common, would condemn this operative measure entirely. No anæsthetic was given, and, in the midst of the struggles of the child, large veins were severed, from which an abundant hemorrhage occurred. The trachea was opened, but this was no sooner done than death occurred, partly from the loss of blood, and partly from the obstruction to respiration caused by its entrance into the bronchial tubes. Such cases are, however, quite exceptional. Death rarely occurs during the operation, unless the patient is already moribund, and the possibility of such a resul
little weight in our decision for or against the o

Few will deny, in the light of statistics, t
in certain cases, proper, and that a physici

culpable if he did not strongly urge its performance. There are certain supposed contraindications. One is age less than two years. It is true that those under the age of two years are less likely to recover after the operation than those above that age; still, tracheotomy has now and then saved the lives of the youngest infants who have croup. The possibility, therefore, of success justifies the performance of the operation, however young the infant, when the only alternative is death. In the foregoing statistics it is seen that one of eight recovered who were under the age of two years.

The presence of capillary bronchitis or pneumonia does not positively contraindicate tracheotomy, though it diminishes greatly the chances of a favorable issue. Nor is tracheotomy forbidden by the extension of the false membrane into the bronchial tubes, since it diminishes the amount of obstruction along which the air passes in order to reach the lungs, and the muco-pus as well as pseudo-membrane, lying below the point of operation, may be expectorated through the aperture. A decidedly asthenic state, as after measles or scarlet fever, indicated by feeble pulse and other symptoms of exhaustion, may or may not contraindicate the operation, whether the pseudo-membrane is limited to the larynx and trachea or is more extensive.

The manner of performing tracheotomy and the subsequent treatment pertain to surgery, and are described in surgical works. A skilful surgeon should, indeed, be employed to perform the operation when it is practicable. At what time in the course of the disease tracheotomy should be resorted to is an important practical question. Trousseau at one time recommended it as soon as there were certain evidences of the presence of a pseudo-membrane, but in the latter part of his life he did not operate so early. The correct rule, in my opinion, is not to operate till there are signs that the blood is not sufficiently oxygenated, such as lividity of the prolabia and tips of fingers. When these signs occur, it is unsafe to delay long. The arrangements should be previously made, that no time be lost.

It is an interesting fact that a large proportion of those who die after tracheotomy die of bronchitis, usually capillary, or of pneumonia developed after the operation. These diseases seem to be partly attributable to the operation, or, if previously existing, to be aggravated by it. It is believed that the introduction into the bronchial tubes and the lungs of cool air, of air not warmed by the natural circuit through the nostrils and larynx, may be a cause of these inflammatory complications. Sometimes, also, the canula by pressure increases the inflammation of the surface on which it lies. Therefore, not only does the operation require skill in its performance, but much of its success depends on the subsequent management. After the operation, the temperature of the apartment should be kept constantly at from 85° to 90°, and loaded with moisture. This obviates in part, but only in part, the tendency to bronchitis and pneumonia. Constant attention should be given to the canula, to prevent its filling with mucus and pus. Trousseau employed a double canula, which can be readily cleaned by removing the internal cylinder. The nurse, when properly instructed, can remove this cylinder as often as may be necessary in order to clean it. Mr. Lawrence, of London, and, following him, some other surgeons, prefer not to use the canula. The edges of the wound are kept apart by a wire which passes around the neck, or a little of the trachea is removed so as to produce a sufficient aperture. The reader is referred for particulars regarding this mode of operating to recent treatises on operative surgery.

After the operation no more medication is required. The patient should be kept quiet and free from excitement. His diet should be mainly liquid, and of the most nourishing character. In a few days, if the symptoms abate, the aperture may from time to time be closed with the finger after the withdrawal of the canula, in order to ascertain if the larynx is free from obstruction. If bronchitis or broncho-pneumonia arise, the oil-silk jacket, with counter-irritation to the chest, is required, and stimulating expectorants, as carbonate of ammonia and syrup of senega, should be ordered.

CHAPTER IV.

BRONCHITIS.

INFLAMMATION of the bronchial tubes, or bronchitis, is pr
the most frequent disease of early life. It is usually ass
with more or less inflammation of the mucous membrane
nostrils, larynx, and trachea. We designate the disease
laryngitis, or bronchitis, according as one or the other in
inates. Sometimes bronchitis occurs with b
nd often the coryza and laryng

Bronchitis occurs both as a primary and secondary disease. The secondary form is common in connection with measles, hooping-cough, pneumonia, and pulmonary phthisis, and it is not uncommon in scarlet fever, variola, remittent and continued fevers. Bronchitis is mild or severe, and acute, subacute, or chronic. If the inflammation affects the bronchules, the bronchitis is called capillary. Bronchitis is usually bilateral, affecting the tubes on the two sides with about equal intensity. The exceptions are when it is dependent on pneumonia or pulmonary phthisis. In these cases it is confined to those tubes, or nearly to those, which are surrounded by the tubercular or inflammatory product.

Causes.—The causes of secondary bronchitis are obviously the diseases in connection with which it occurs. The cause of primary bronchitis is the same as that of simple acute laryngitis or coryza, namely, sudden change of temperature from warm to cold, exposure to currents of air, the practice of sending children without sufficient clothing from heated rooms into the open air, the throwing off of bedclothes at night, etc. Dentition is also an occasional cause, since some children have attacks which coincide with the eruption of the teeth. The cough of dentition is usually purely a nervous affection; but in other instances it is accompanied by more or less mucous secretion, and is evidently dependent on a mild inflammation.

Anatomical Characters.—In the most common form of bronchitis, the larger bronchial tubes only are affected. They are the seat of the inflammation in most of those cases which are designated "colds" by families, and which are often treated without the aid of the physician. The lining membrane of the bronchial tubes presents the ordinary anatomical characters of mucous inflammations. It is reddened uniformly or in patches, intensely, or in that milder degree known as arborescence, according to the severity of the inflammation.

The secretion of the muciparous follicles is at first arrested, and the surface of the membrane is dry. In the course of a day or two the secretory function is re-established, and the surface is covered with thin and transparent mucus. A day or two later, the secretion becomes thicker, consisting of mucus and pus. Mixed with these substances are epithelial cells, which are exfoliated in abundance from the inflamed surface. At the same time the mucous membrane becomes thickened and more or less softened. If the inflammation is severe, the vessels of the submucous cellular tissue are also injected.

Usually, in about a week in the young child, in from one to two weeks in older children, the inflammation begins to abate. Gradually the inflamed membrane returns to its normal consistence, thickness, and vascularity, and with this return to the healthy state the muco-purulent secretion abates.

In this, which is the simplest form of bronchitis, and most common, there is no ulceration, and rarely any pseudo-membranous formation, if the disease is idiopathic. Pseudo-membranous bronchitis is not unusual as an accompaniment of pseudo-membranous laryngo-tracheitis.

Were bronchitis limited to the larger bronchial tubes, it would indeed be a simple affection, but unfortunately it has a tendency to extend downwards. Commencing in the larger, it gradually invades the smaller tubes in a similar manner to the extension of erysipelas upon the skin. More rarely the inflammation commences simultaneously in the larger and smaller tubes. Now the gravity of bronchitis is proportionate to the degree of its extension downwards. It may stop at any point in its progress, but if it reach the smaller tubes it is one of the most serious affections of early life, that already alluded to, namely, capillary bronchitis.

The mucous membrane of the minute tubes, those next to the air-cells, is delicate, with but little submucous connective tissue, and it frequently, at post-mortem examinations, does not present to the eye those distinct inflammatory changes which are observed in tubes of large diameter. It is sometimes not notably thickened, nor its vascularity much increased, even when there is reason to believe from the symptoms that it was the seat of active phlegmasia. As we pass from these minute tubes to those of larger calibre, the inflammatory lesions become more distinct. The inflammation produces minute and abundant points of redness, and the membrane is evidently thickened; often it is rough or granular.

The minute bronchial tubes are very small, especially under the age of three years, and since in capillary bronchitis a large proportion of them are inflamed, the source of the danger is apparent. It is with difficulty that the patient with capillary bronchitis can, by the effort of coughing, free the tubes from the secretions which are constantly collecting in them. In weakly children, under the age of two years, expectoration is most difficult, and hence the great and increasing dyspnœa from which such patients suffer.

In unfavorable cases of capillary bronchitis, the following changes are apt to occur. The small tubes, usually those in the posterior portion of the lungs, become more and more loaded with mucus and pus, obstructing the entrance of air till, finally, one after another of the lobules cease to be inflated. As the air passes out of the air-cells of a lobule more readily than it enters them, partial lobular collapse occurs. Doubtless, also, some of the mucus and pus, no longer expectorated, is forced backward into the air-cells. Now, a portion of lung from which air is excluded while the circulation continues, becomes congested. If the lungs of a patient who has died at this stage of capillary bronchitis are examined, the anterior portions will be found to present nearly their normal appearance, while the lobular changes which have been described will be found mainly in the posterior part. Certain of the lobules will be observed depressed below the common level, of a dark red color from passive congestion, firm to the touch, and non-crepitant or feebly crepitant. Sometimes only a few of the lobules have undergone this change of collapse and congestion, but more frequently a considerable number on both sides are affected.

Up to this time there is often no pneumonia, but this is the state of lungs and bronchial tubes which has sometimes been mistaken for and designated broncho-pneumonia. It has also been called lobular pneumonia. The substance which fills the bronchial tubes is usually muco-purulent, but in exceptional cases, in addition to mucus and pus, there is more or less fibrin. This ordinarily occurs as a delicate film of small extent, observed here and there, and readily detached from the surface underneath. In rare instances it occurs as a firm and continuous membrane, forming a mould of the tubes, increasing greatly the dyspnœa, and constituting a true bronchial croup.

If the patient survive the immediate effects of capillary bronchitis, the inflammation of the mucous membrane soon begins to abate. The collapsed and congested lobules, and the terminal portions of the bronchial tubes leading to them, which are obstructed by inflammatory products, ordinarily return to their normal state as the inflammation declines, but in other instances they undergo changes which are interesting, but which are not fully understood. When the function of a portion of lung ceases, as it does when the air is excluded from it, the cells and nuclei which it contains, and probably other parts, begin to undergo fatty degeneration. These elements become granular, somewhat enlarged and opaque, and here and there mixed with them are other large cells filled with oil globules. These are the compound granular cells of pathologists, and, occurring in this situation, are produced by metamorphosis of the epithelial cells. They are epithelial cells which have progressed more rapidly than others in fatty degeneration, having reached that stage of it which immediately precedes liquefaction. We often with the microscope observe not only these corpuscles, but their fragments as they are dissolving. These changes are common in lobules which are for a certain time collapsed and congested, whether or not pneumonia has supervened.

If the lobules remain collapsed for a considerable period on account of the feeble inspiratory efforts of the child, and the presence of mucus and pus which obstruct the tubes, they may undergo such change that they are not inflated, even when the tubes become freed from obstruction. If an opportunity is presented of examining the lungs at this time, it will be found difficult, if not impossible, to expand, even by strong insufflation, the lobules which have been for a considerable period collapsed and more or less congested. These lobules have a greater specific gravity than water, and closely resemble lobules which are solidified by inflammation; but when the changes occur which have been detailed above, there is obviously no true pneumonia at first.

Pneumonia is, however, a not infrequent complication and result of capillary bronchitis. While in certain lobules collapse and simple congestion occur, others may be affected by a true inflammation extending from the adjacent inflamed tubules. Therefore in fatal cases it is not unusual to find in the same lung lobules collapsed and congested, and others hepatized. In the former there is diminution in the size of the alveoli, with simple congestion, while in the latter the alveoli are of full size, or distended in consequence of the abundant proliferation of cells within them. Pneumonia may also occur as a sequel of capillary bronchitis in lobules, which in consequence of the feebleness of the infant, or other cause, remain collapsed and congested, since tissues remaining in a state of passive congestion are very prone to inflammation. That pneumonia, subacute and catarrhal, does occur in the collapsed lobules, is demonstrated by the fact of a proliferation of cells within the alveoli.

Minute abscesses, usually directly under the pleura, have occasionally been observed at the autopsies of those who have recently had capillary bronchitis, and pathologists are not agreed as to the mode in which they are produced. Some of them, if not all, are evidently connected with the minute bronchial tubes, and the quantity of pus contained in each is not usually more than one or two drops. The most reasonable view of their causation is that they are produced in the terminal tubes where the mucus and pus collect. The pus acts as an irritant and causes inflammation, and the inflammation increases the quantity of pus. The walls of the tube which is now the seat of an abscess are destroyed by ulceration, and probably, also, some of the contiguous air cells. The little cavity is soon surrounded by a delicate membrane, the same in character, though less thick and firm, with that which constitutes the walls of larger abscesses. The pus presents the usual appearance of this liquid, or it may be tinged by the presence of blood cells, or again it may be thick from partial absorption of the liquor puris so as to resemble softened tubercle.

The abscess is ordinarily located in the centre of a collapsed lobule. In certain cases it approaches the surface of the lungs, so as to produce circumscribed pleurisy, with adhesion of the costal and visceral pleura. At the autopsy of such a case, on separating the adhesions and attempting insufflation, the air passes through the aperture, so that the lung on that side cannot be inflated unless the aperture is closed. Occasionally pneumothorax results from opening of the abscess into the pleural cavity.

Dilatation of the bronchial tubes is an occasional result of bronchitis, especially when severe and protracted. Emphysema is a common lesion observed in young children, whether death has occurred from disease of the respiratory or some other system. It is observed most frequently in the upper lobes, and oftener in their anterior than posterior portions. If it is vesicular, the sacs of air are numerous and minute, but if interstitial, they are large and irregular. If they are upon or near the surface of the lung so as to distend the pleura, they may attain considerable size. I have seen them of the size of a filbert in infants under the age of one year. In exceptional cases there are many of these air bladders situated between the root of the lung and its anterior border, and perceptibly augmenting its volume. Severe bronchitis attended by labored respiration and a large collection of muco-pus in the tubes, while it produces collapse of certain lobules, is recognized as a common cause of these emphysematous lesions.

SYMPTOMS.—It is evident, from the description which has been given of the anatomical characters of bronchitis, that its symptoms vary greatly in severity in different patients. It usually commences with more or less coryza. The symptoms are headache, flushed face, elevation of temperature, acceleration and fulness of pulse. In the mildest cases these symptoms are scarcely appreciable.

The child is observed to sneeze and have some defluxion from the nostrils, and this is followed by an occasional mild, almost painless, cough, which declines in the course of a few days. The respiration and pulse are scarcely accelerated, and the appetite is but slightly impaired. There may be a little fretfulness, but the child is not confined to his bed or room, and usually amuses himself with his playthings. Auscultation in these mild cases reveals coarse mucous râles in the larger bronchial tubes, while the smaller tubes are free from mucus. Sibilant and sonorous râles are also observed, especially in the commencement of the bronchitis, at which time the secretion of mucus is suppressed or scanty. The cough in the commencement is for the same reason dry. It becomes looser by the second or third day, the sputum consisting of frothy mucus, with the admixture of pus and epithelial cells. The pus becomes more abundant as the disease continues. Expectoration does not usually occur till after the age of four or five years; under this age the sputum is ordinarily swallowed.

The mild form of bronchitis described above, that in which only the larger bronchial tubes are affected, is common at all periods of infancy and childhood, but a severer grade of the disease is also of common occurrence, exclusive of those cases in which the minute branches of the bronchial-tree are affected. It has already been stated that there is a tendency in bronchial inflammation to extend downwards, and symptoms are proportionate in gravity to the degree of this extension. In severe bronchitis the pulse rises to 120 or 130 per minute, and the respiration is in a corresponding degree accelerated. The cough is frequent and painful, the pain being referred to the sternum, and often there is a steady dull pain in this region. The face is flushed and indicative of suffering, the temperature is considerably elevated, and the appetite is greatly impaired or lost. There is frequently an exacerbation of symptoms in the latter part of the day. Depression of the infra-mammary region during inspiration, and dilatation of the alæ nasi, accompany grave attacks of the inflammation.

Auscultation in severe bronchitis reveals the presence of râles in all parts of the chest, sibilant and sonorous sparingly, coarse mucous and sub-crepitant more abundantly.

Capillary bronchitis or suffocative catarrh, the most dangerous form of this inflammation, is less frequent than bronchitis, which is limited to the larger tubes, or to the larger tubes and those of medium size. It may commence quite abruptly, but ordinarily it results from the milder form of the disease. The symptoms at first are such as occur in the common form of bronchial inflammation, but instead of abating or remaining stationary, they gradually increase in severity till, suddenly, marked dyspnœa supervenes. The inflammation has now reached the minute tubes, and what promised to be an ordinary attack of bronchitis becomes one of great severity and danger.

The respiration in *capillary* bronchitis is short and hurried. Sixty to eighty inspirations per minute are not infrequent, while the pulse also is greatly accelerated, attaining as high a number as 140 to 160 or 180 beats per minute. The cough is frequent, and the sputum, which collects in abundance, is expectorated with difficulty. If expectorated so as to be examined, it is found to consist largely of frothy mucus with epithelial cells. After a few days, if the patient live, it becomes more purulent. Sometimes, as in bronchitis of the adult, streaks of blood appear upon the mucus. In the first days of capillary bronchitis, the temperature is considerably elevated, the face flushed and indicative of suffering. The patient is restless, moving from one part of the bed to another, seeking in vain for relief. The digestive function is impaired, as in all severe inflammations; the tongue is moist and covered with a light fur; the appetite is nearly or quite lost. The nursing infant nurses with difficulty, frequently relinquishing the breast on account of the dyspnœa; older children take no solid food in consequence of the anorexia and the dyspnœa, and even drinks are swallowed hastily and apparently without relish, since deglutition interferes with respiration. On auscultation in capillary bronchitis, at first sibilant, and after a day or two sub-crepitant, râles are observed in every part of the chest. Percussion elicits a good resonance, unless the substance of the lung has become involved. As the disease approaches a fatal termination, the pulse becomes greatly accelerated, the respiration is also in a corresponding degree frequent and panting, the inspiration being accompanied by marked infra-mammary depression and dilatation of the alæ nasi. The face becomes pallid, the prolabia livid, and the tips of the fingers livid and cool. The mucus and pus, accumulating in the air passages, increase more and more the obstruction to the entrance of air, and, finally, death occurs from apnœa. The nursing infant usually ceases to nurse for several hours before death, and a state of stupor commonly precedes the fatal event, in consequence of the carbonaceous state of the blood. In young infants, especially those under the age of six months, not only in capillary bronchitis, but in severe ordinary bronchitis, I have often observed toward the close of life, intermissions in the respiration. It occurs after every six or eight or ten respirations, and equals in duration the time occupied in, perhaps, half a dozen respiratory movements. It is, therefore, an unfavorable prognostic, but some recover by stimulation in whom it occurs.

The duration of acute bronchitis varies according to the extent of the inflammation. In the mildest form, the patient is convalescent after three or four days, and, in severer forms that terminate favorably, the disease begins, ordinarily, to decline by the close of the first week or in the second. The progress of bronchitis is somewhat more rapid in young children than in those of a more advanced age. When convalescence is fully established, it is not unusual for the cough to continue three or four weeks, though gradually declining. It is loose and painless, and is scarcely regarded by the patient.

Death sometimes occurs as early as the second or third day in capillary bronchitis. The younger the infant, with the same extent and intensity of inflammation, of course the sooner the fatal result. The ordinary duration of fatal bronchitis is from six to eight days. If the patient pass beyond the tenth day, decline of the inflammation may be confidently expected, and recovery, unless there is a complication.

Occasionally bronchitis becomes chronic, lasting several months before it entirely ceases. The *chronic* form may result from mild, as well as severe, bronchitis. The active fever and accelerated respiration which characterize the acute affection abate, and the general health is nearly or quite restored; but an occasional cough continues, and the respiration is often audible, from the mucus which collects in the tubes, or from thickening of the mucous membrane. Sometimes there is moderate febrile movement, especially in the latter part of the day. On auscultation, coarse mucous, with perhaps sibilant and sonorous, râles are observed in the chest.

There is great liability in chronic bronchitis to exacerbations. The disease often seems to be abating, and there is prospect of its speedy cure, when all the symptoms are intensified. The exacerbations are due to the fact that the bronchial surface, when it has been a considerable time inflamed, is very sensitive to the impression of cold. Even when the disease is entirely relieved, it is very apt to return by exposure to currents of air or changes of temperature. Chronic bronchitis occurs most frequently in the winter and in the spring and fall, when the weather is changeable, and is most intractable in these periods of the year. Many cases of chronic bronchitis are associated with dilatation of the bronchial tubes or with emphysema. The general health in chronic bronchitis, when not dependent on a tubercular deposit, ordinarily remains good. Tubercular bronchitis, which is the result of a grave disease, does not require a separate consideration. It is attended with emaciation, and is obstinate on account of the nature of the primary affection. It is due to the irritating effect of tubercular matter lying against the bronchial tubes.

Diagnosis.—Bronchitis can ordinarily be diagnosticated by the character of the respiration and cough. The absence of hoarseness, stridulous inspiration, and croupy cough, excludes laryngitis; and the absence of the expiratory moan and of the stitch-like pain on coughing, which characterize pneumonia and pleurisy, excludes those diseases. Accurate diagnosis, however, can be most readily made by percussion and auscultation. Examination of the chest enables us to state with positiveness, not only the nature, but the extent of the affection. If the inflammation is confined to the larger bronchial tubes, coarse râles are discovered in them, while finer mucous râles are absent. If the bronchitis is capillary, subcrepitant râles are discovered in the smaller tubes. Percussion gives clear resonance on both sides, except in those instances in which collapse or pneumonia has supervened.

Prognosis.—Bronchitis, limited to the larger bronchial tubes, or to these and those of medium size, terminates favorably in a large majority of cases. Occasionally, severe inflammation, not extending to the smaller tubes, proves fatal in young infants, or those of feeble constitution. True capillary bronchitis is, on the other hand, a disease of great danger. It may be fatal at any period of childhood, but the younger the patients and more feeble, the greater the proportion of deaths. Under the age of one year, it is one of the most fatal diseases of early life.

The prognosis, in the commencement of all cases of bronchitis of average severity in the young child, should be guarded, on account of the tendency of the inflammation to extend, since ordinary bronchitis may become capillary. After five or six days, extension ceases, and, if during that time there is no increase in the severity of symptoms, the prognosis is favorable. Signs which indicate an unfavorable result are increasing frequency of pulse and respiration, difficult and scanty expectoration, restlessness, a countenance indicative of suffering, and a progressively greater accumulation of mucus in the bronchial tubes, as determined by auscultation. Pallor and coldness of the face and extremities, lividity of the tips of the fingers, rapid and feeble pulse, drowsiness, diminution of cough, while the mucus and pus accumulate in the bronchial tubes, and, in young children, intermissions in the respiration, indicate the near approach of death. Cases may, however, recover by proper treatment, although the symptoms are most unfavorable.

It is unnecessary to mention the favorable prognostic signs of bronchitis. This disease, when fully established, continues a certain number of days, whatever remedial measures are employed, and if the symptoms do not increase in severity during the first five or six days, a favorable result is highly probable. The prognosis in chronic bronchitis is ordinarily favorable, so far as life is concerned, provided there is no emaciation. If there is emaciation, the bronchial inflammation may be due to tubercles in the bronchial glands or lungs, and, of course, the prognosis is unfavorable.

TREATMENT.—Bronchitis may be rendered much milder, and perhaps even prevented, by an emetic employed in the first twelve or twenty-four hours, in conjunction with a warm bath. The physician is not, however, ordinarily called sufficiently early to render this treatment effectual. The remedial measures proper for this disease vary greatly, according to the stage and intensity or extent of the inflammation and the age of the patient. Bronchitis, *limited to the larger tubes*, requires simple measures. A laxative may be employed, with a mild expectorant, and moderate counter-irritation should be produced by camphorated oil, or the occasional employment of a sinapism. I have sometimes ordered for these cases a mixture recommended by Dr. James Jackson, of Boston, in his letters to a young physician. "For young children," . . . . says he, "I employ the following: Take of either almond or olive oil, of syrup of squills, of any agreeable syrup, and of mucilage of gum acacia, equal parts, and mix them. Of this mixture, a teaspoonful may be given to a child at two years of age; a little less if younger, and increased if older, so as to double the dose to one in the sixth year. This may be given from three to six times in the twenty-four hours. Sometimes a little opiate must be added at night to appease an urgent cough." These cases also do well with simple mucilaginous drinks in conjunction with gentle aperients.

Bronchitis, *extending* beyond the primary or secondary bronchial divisions, requires more careful watching and more decided measures. The abstraction of blood by leeches, or otherwise, is seldom required in the treatment of bronchitis. Occasionally, it the inflammation is intense and the symptoms urgent, moderate abstraction of blood at an early period may be useful, but the employment of cardiac sedatives under such circumstances is generally preferable.

As a rule, actively depressing agents should be avoided in the treatment of bronchitis in patients under the age of two years; and, on the other hand, sustaining remedies are in a large proportion of cases required after the first two or three days. Many infants with bronchitis are sacrificed in consequence of the old theory, which still influences medical practice, that an inflammation, with its increased force of circulation, is necessarily best controlled by depletory and sedative measures. Remedies too depressing are prescribed, and with a less favorable result than would follow a strictly expectant course of treatment.

What is, therefore, the proper mode of treating bronchitis, severe or of ordinary gravity, occurring in infancy and childhood? It is supposed that the physician is called when the inflammation is fully established, or that, if he has seen the patient at the commencement, and has prescribed an emetic, it has failed to throw off the disease. A large emollient poultice, not thicker than the cover of a book, so wet as to produce constant moisture of the surface, and sufficiently irritating to produce constant redness without necessitating its removal, should be applied to the front and sides of the chest, and over it an oil-silk jacket placed. I prefer a poultice of the following:—

℞. Pulv. sinapis ℥ss;
Pulv. semin. lini ℥viij. Misce.

Local treatment in bronchitis is very important. The exact mode of applying it, or the substances used, matters little, provided it meets the indication, which is twofold—namely, derivation to the surface, and the application to it of warmth and moisture. Such applications are found, by experience, to give most relief. Warmth and moisture are furnished by cataplasms most conveniently, or by warm water applications under oil-silk.

Derivation to the surface, early made and repeated, tends to check the downward extension of bronchitis; but it is not advisable to vesicate, or to produce anything more than moderate and continued redness. Often improvement in symptoms is observed, especially less dyspnœa and restlessness, immediately on the employment of the local measures recommended above.

The general or internal treatment appropriate for bronchitis varies according to the age and the character of the inflammation, whether primary or secondary. The following formula will be found useful for infants affected with primary bronchitis:—

R. Spts. æther nitr. ʒj;
Syr. ipecacuanhæ,
Ol. ricini, āā ʒij;
Syr. bal. tolut. ʒvij. Misce.

One teaspoonful for an infant one year old every two to four hours.

Another eligible formula is the following:—

R. Syr. ipecacuanhæ ʒij;
Potas. acetat. gr. xvj–ʒss;
Aq. anisi ʒxiv. Misce.

Dose, one teaspoonful for an infant of six months.

If there is decided febrile reaction, tincture of digitalis, one or two drops, according to the age, may be added to each teaspoonful.

In a majority of cases of infantile bronchitis, this mode of treatment is appropriate only for the first few days, after which, if farther medication is required, more sustaining, or even stimulating, medicines are proper.

For children over the age of three years, if the previous health has been good, and the bronchitis is primary, aconite or veratrum viride is often useful in the first stage of the inflammation. The following is a recipe for a child of five years:—

R. Tinct. rad. aconit. gtt. xij;
Syr. scillæ comp. ʒij;
Syr. bal. tolut. ʒxiv. Misce.

One teaspoonful every two to four hours; the medicine to be omitted, or given at a longer interval, if the frequency of the pulse is reduced.

The tincture of veratrum viride is more powerful than that of aconite, and may be employed in the same dose for those who are more robust.

The effect of cardiac sedatives should be carefully watched. In general they should be administered only during the first three to five days; but if the child is robust, with full and strong pulse, they may be continued longer. As the active inflammation begins to abate, simple expectorant mixtures may be given, as syrup of squills, or ipecacuanha in spiritus Mindereri. At this stage of bronchitis, it is often best to commence the use
pectorants, and they are required in nearly
bronchitis. In secondary forms of the dise
in connection with hooping-cough or mea

should be employed from the first; and also if there is a state of feebleness or cachexia, although the bronchitis is primary. It is important for successful practice to be able to determine at what period in the disease this class of medicinal agents should be prescribed. In doubtful cases, it is safer to prescribe them than those of a depressing character; but it is better to employ, for a day or two, a simple mucilaginous or other soothing mixture, after which a stimulating expectorant can be given. A favorite prescription with me is the following:—

℞. Ammon. carbonat. gr. xvj–xxiv;
Tinct. sanguinar. gtt. xxiv;
Syr. senegæ ʒij;
Ext. glycyr. ʒss;
Aquæ ʒxiv. Misce.

Dose, one teaspoonful every two or three hours to a child of two years.

If there is restlessness, Dover's powder, paregoric, or syrup of poppies should be given with this mixture, or separately.

As convalescence approaches, the medicine should be administered less and less frequently or in smaller doses. Emetics in ordinary cases of bronchitis are not required, except in the commencement. In severe bronchitis, however, especially when the smaller tubes are inflamed, they are sometimes of great service. The cases which require their administration are those in which mucus and pus collect in the tubes more rapidly than they are expectorated, so as to give rise to urgent dyspnœa. Nothing gives such decided and immediate relief under these circumstances as an emetic. The object to be gained is obviously very different from that in the commencement of bronchitis, and such agents should be employed as act promptly, with the least possible depression. Sulphate of zinc or of copper is, therefore, an appropriate medicine. The former may be given in a dose of five grains; the latter, of one or two grains to a child five years old. If there is considerable strength of pulse and heat and dryness of surface, ipecacuanha may be administered. If there are evidences of exhaustion, stimulants may be administered immediately before and after emesis. Infants oppressed by the accumulation of mucus and pus may sometimes be relieved by tickling the fauces with the finger. This provokes vomiting, and the viscid mucus which collects at the entrance of the glottis is removed by the finger.

In secondary bronchitis whatever the age, in primary or secondary occurring in infants or feeble children, the diet should, as a rule, be nutritious through the entire disease. Robust patients, or those who have had ordinary health, if over the age of two years and affected with primary bronchitis, should have light diet, chiefly farinaceous in the first days of the attack, after which animal broths are proper. Whatever food is given in severe bronchitis must be in the form of drinks, since the appetite is lost, while the thirst is such that liquids are less likely to be refused.

In primary bronchitis, if mild or of ordinary severity, alcoholic stimulants are not required. In secondary bronchitis they are often needed, and also in capillary or severe ordinary bronchitis if there is dyspnœa with evidences of prostration. The occasional loose cough which is often present during the period of convalescence requires but little treatment; either no medicine or a gently stimulating expectorant may be given.

CHAPTER V.

PNEUMONITIS.

In children over the age of five or six years, pneumonitis differs but little in form or phenomena from that of the adult, being ordinarily primary except as it depends on an irritant, as tubercles, and extending rapidly over one or more entire lobes. In those under the age of five years it is, on the other hand, as a rule, a secondary affection, and limited to a part of a lobe. Most writers, until recently, have classified cases according to their origin as primary and secondary, or their extent as lobar and lobular, or their duration as acute or chronic. A better classification, having an anatomical basis, is that into catarrhal, croupous, and interstitial.

Catarrhal pneumonitis consists in an inflammation of the air-cells, with an abundant proliferation of epithelial cells within them, and the exudation of serum but not of fibrin. The secondary and lobular pneumonitis of young children, alluded to above, is usually of this character. Croupous pneumonitis consists also in an inflammation of the alveoli, but with an abundant formation of pus-cells within them, and the exudation of fibrin and
and primary pneumonitis of advanced childr
monly of this character. In both catarrha
nitis, therefore, the solidification of the lu

due mainly to the newly-formed cellular elements with which the alveoli are filled, though the source and nature of these cells differ in the two diseases. Interstitial pneumonitis consists in an inflammation and hyperplasia of the connective tissue of the lungs. It is the chronic pneumonia of authors, resembling in many respects, in its anatomical and clinical characters, cirrhosis of the liver. The inflammation which produces this result is subacute, and in nearly all cases is dependent on some persistent local disease in the minute bronchial tubes or lungs, as softened or cheesy tubercles, cancer, abscesses, protracted inflammation of the alveoli or bronchioles, whether produced by the inhalation of dust of an irritating nature or other cause. Interstitial pneumonia is much more rare in children than adults, and, as it presents no peculiar features in them, it need only be alluded to in this connection.

CAUSES.—Croupous pneumonitis in most cases results from that common cause of inflammations—namely, taking cold. It commences as a primary disease within a few hours after exposure. Catarrhal pneumonitis, in exceptional instances, also commences abruptly as a primary disease from the same cause, but being, probably in nine cases out of ten, secondary, it commonly results from antecedent pathological states, which we will enumerate.

First. Many cases result from bronchitis. The inflammation extending downward engages the minute bronchial tubes, and from them traverses the alveoli of one or more lobules. This is the broncho-pneumonia of children described by authors; it occurs most frequently between the ages of six and eighteen months.

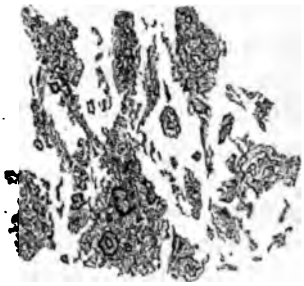
Secondly. Hypostasis, or passive congestion, is an important factor in the causation of many cases, and in feeble infants it is not infrequently the sole cause. Infants with feeble health and languid circulation, lying in their cribs day after day with little movement of the body, are very liable to passive congestion of the depending portions of their lungs, and this by and by eventuates in a cell proliferation within the alveoli—in other words, a pneumonia presenting some peculiarities, but of the catarrhal form. In foundling hospitals, where feeble infants are received and treated, this is one of the most frequent pathological states, and is the prevailing form of pulmonary inflammation. It is sometimes described as hypostatic pneumonia. Hence physicians, whose observations have been largely in such institutions, have almost ignored any other form of pneumonia in infants. Billard, a close and accurate observer, wrote nearly half a century ago: "Pneumonia of infancy presents peculiar characters, in which it differs from the same affection in adults. Instead of being an idiopathic affection arising from irritation developed in the pulmonary tissue under the influence of atmospheric causes, which often excite the disease, the pneumonia of young infants is evidently the result of a stagnation of blood in their lungs. Under these circumstances this blood may be regarded as a kind of foreign body . . . . It would, therefore, appear that inflammation of the lungs, which produces hepatization, arises in infants, in general, from some mechanical or physical cause." Valleix also states that he found the lesions of pneumonia in a majority of the infants who died in the Hôpital des Enfants Trouvés. The statements of Valleix are applicable also to the Infants' Hospital, and Nursery and Child's Hospital, of this city, as regards those cases in which death results from chronic disease. We shall see hereafter that hypostatic pneumonia is one of the most common complications of chronic infantile entero-colitis, the summer complaint of the cities.

Thirdly. Catarrhal pneumonia of infants sometimes results from collapse. It is not unusual to find, at the autopsies of infants who have died in a state of emaciation and feebleness, portions of the lungs remote from the bronchi collapsed, as, for example, the thin edges of the inferior lobes, and the tongue-like process of the left upper lobe, the process which lies over the heart. The immediate cause of the collapse has been a bronchitis, or it has resulted directly from the general weakness of the infant, and its feeble respirations. Now, a collapsed lung soon becomes affected by passive congestion. The functional activity of an organ favors circulation through it, and if the function is abolished the flow of blood in the part is retarded, and stasis more or less complete results. The hyperæmic state of collapsed pulmonary lobules presents the same anatomical condition for the supervention of pneumonia, as occurs in cases of hypostatic congestion. Consequently, cell proliferation soon begins in the collapsed alveoli, the volume of the affected lung increases, and it becomes firmer and more resisting to the touch, and the microscope reveals the characters of a subacute but genuine catarrhal pneumonitis. I have made or have procured microscopic examinations of a considerable number of such specimens, and have found the alveoli more or less filled with cells of the epithelial character.

In rare instances in infancy and childhood pneumonitis results, as it more frequently does in the adult, from an embolus detached from a clot, which had formed in some remote vein, in consequence of arrest of circulation in it, by inflammation of the contiguous tissues. This is described by writers as a distinct form of pneumonitis designated embolic or embolismal. A specimen showing this mode of causation was exhibited by me at the New York Pathological Society, in February, 1868. An infant born January 22d, 1868, of strumous parents, had been fretful, but without appreciable ailment till February 3d, when inflammation of the connective tissue occurred on the anterior aspect of the left leg, a little below the knee. This extended downwards, suppurated, and the pus was evacuated February 5th. In the mean time, three other similar inflammations occurred, two on the right foot and leg, and the other over the parietes of the chest in the right infra-mammary region. Suppuration occurred in all of these.

On February 8th this infant was suddenly seized with extreme dyspnœa, and died in a few hours. Numerous minute puriform collections (formerly called metastatic abscesses) were discovered in each lung, most of them scarcely larger than a pin's head. One of them on the right side in the middle lobe connecting with a bronchial tube had ruptured into the pleural cavity, causing pneumothorax, collapse, and incipient pleuritis.

The annexed figure exhibits the microscopic appearance of this softened fibrin, which, to the naked eye, so closely resembled pus.



On account of the speedy death, the emboli had produced, in the lobules where they had lodged, little more than congestion or the first stage of pneumonitis around them. Had the infant lived longer, doubtless the ferments or the vibriones, which some consider the irritating element of emboli, would have produced suppurative inflammation.

Anatomical Characters.—Nothing need be added in this connection to what has already been said, in reference to interstitial and embolismal pneumonias. Being comparatively rare in children, they present the same anatomical characters as in the adult. That unimportant form of pneumonia called pleurogenous, and which consists in a croupous inflammation of the superficial infundibula of the lung underneath an inflamed pleura, occurs in children as well as adults. Being secondary to the pleuritis produced by extension of the inflammation of the pleura, it gives rise to no physical signs, or appreciable symptoms, on account of its slight extent, and as it presents no peculiar features in the child, it need only be alluded to.

Croupous pneumonitis, which we have stated is the ordinary form of pulmonary inflammation in children over the age of five years, has the same anatomical characters as in the adult. It ordinarily involves an entire lobe. It is more frequent in the right than left lung, and in whichever lung it occurs its most frequent seat is the lower lobe. The inflammation may, however, be limited to an upper lobe, especially on the right side. It ordinarily commences near the root of the lung and extends forward.

Croupous pneumonitis presents three stages, that of congestion, red hepatization, and gray hepatization. In the stage of congestion the capillaries in the walls of the alveoli are greatly distended, bulging forward in loops within the alveolar spaces so as to diminish them, and a viscid albuminous fluid begins to exude, in which points of extravasated blood appear. The affected lung in this stage has a deep red color, its elasticity is greatly diminished, and its density and weight increased. On account of the reduced size of the alveoli from the bulging of the alveolar walls, and the viscid fluid within the alveoli and terminal bronchial tubes, the function of the affected lobe is nearly lost, and hence the dyspnœa which patients experience in the first stage of the inflammation.

The second stage is characterized by the continued and increased escape of the liquor sanguinis, and red and white corpuscles, through the stigmata or little apertures which exist normally in the walls of the capillaries. The inflamed alveoli, and the minute bronchial tubes which terminate in them, are filled with this pneumonic exudation. The relative proportion of the elements of the blood in the exudate varies in different cases. Fibrin is always present, immediately coagulating in delicate filaments within the interstices of which the corpuscles are lodged. The white corpuscles in some cases are much in excess of the red, while in others the red predominate. The lung in the second stage contains no air, has a greater specific gravity than water, is friable so as to be readily torn and penetrated by the finger. The torn surface in the adult presents a granular appearance, each granule being the contents of an air-cell. In the child the granules are not distinct on account of the small size of the air-cells, but the volume of the inflamed lobe is somewhat increased as in the adult.

The stage of gray hepatization succeeds, in which the volume of the lung is still greater. The change of color is due partly to the compression of the capillaries by the inflammatory material, partly to the destruction of the red corpuscles, and disappearance to a greater or less extent of their coloring matter, while the white corpuscles (pus-cells) remain, but more to commencing fatty degeneration in the exudate prior to its liquefaction. In favorable cases the lung soon returns to its normal state, the liquefied substance which filled the alveoli being in part absorbed, in part expectorated.

Croupous pneumonitis often causes inflammation of the portion of the pleura which covers it. Pleuritis developed in this way is circumscribed, but it frequently extends beyond the inflamed parenchyma to the distance of one or two inches. Bronchitis is also a common accompaniment. It may be general, in which case it occurs independently, or be limited to the tubes lying within the inflamed lung, in which case it results like the pleuritis from the pneumonitis. It is seen from this description that the pus-cells which are produced so abundantly in the alveoli are believed to be chiefly exuded white corpuscles of the blood. Possibly some of them may be produced by proliferation of the epithelial cells, which line the alveoli, in the same manner as they are believed to be produced in the bronchial tubes.

Catarrhal pneumonitis, which is, as we have stated, for the most part the lobular pneumonitis of writers, and which, with an occasional exception, is the form of inflammation in children under the age of five years, presents not only clinical but anatomical features, which distinguish it from the croupous form of the disease. Those who have witnessed few post-mortem examinations of young children, and whose views of the lesion are influenced by the expression lobular, are apt to suppose that there is an alternation of inflamed and healthy lobules, so that the surface of the lung presents an appearance not unlike mosaic work. This is a mistake. Although an entire lobe is seldom inflamed as in croupous pneumonitis, the inflammation commonly extends over more or fewer contiguous lobules, but we find certain lobules in the midst of the inflamed area, which are but slightly affected or have escaped entirely. The extent of the inflammation is ordinarily from one to three inches, but I have seen a nodule of true catarrhal pneumonia not larger than a pea, while every other portion of the lung was healthy. On the other hand, almost an entire lobe may appear hepatized to the naked eye as in the croupous inflammation, but by a careful examination certain lobules will be found unaffected. Thus, in a case in the Nursery and Child's Hospital, in which death occurred at the age of one year from pneumonitis supervening upon pertussis, an entire lower lobe, with the exception of a little of its anterior border, presented the appearance and feel of red hepatization, but a careful microscopic examination revealed not only the absence of fibrin in the exudate, showing the catarrhal nature of the inflammation, but also certain lobules in the midst of the inflamed lung which were not involved.

The first change occurring in a lung invaded by catarrhal pneumonitis is congestion, whether active, as in the common form of the disease, in which the inflammation has extended into the lung from the bronchioles, or passive, as when the inflammation results from hypostasis or collapse. An exudation of serum, but not of fibrin, follows, and soon the epithelial layer which lines the alveoli begins to swell. The nuclei of the epithelial cells divide, the cells themselves forming large round cells with vesicular nuclei. These cells, to which the solidification of the lung is mainly due, are, therefore, on account of their origin and appearance, regarded as epithelial. The alveoli in catarrhal pneumonitis, it is seen, are filled with an inflammatory product quite different from that in the croupous inflammation.

Inflammation of the pleura over the inflamed lung, so common in croupous pneumonia, and which gives it the name pleuro-pneumonia, by which it is sometimes designated, rarely occurs in this disease. The seat of this inflammation is ordinarily the posterior part of the lungs, even when it results from extension of the inflammation from the bronchial tubes. When resulting from collapse, it affects chiefly those lobules which are remote from the bronchi, and which the air enters only by a long circuit.

Catarrhal pneumonitis, when it arises from extension of acute inflammation of the bronchioles, is acute, but in those forms of the disease which supervene upon passive congestion it is subacute. The alveoli are less distended by inflammatory products than in croupous pneumonia, not only from the absence of fibrin, but from a less amount of cells. Hence the volume of the inflamed lung is not so great as in that disease, and the torn surface, even in the adult, does not present a granular appearance. Hence, also, the stage of gray hepatization does not supervene so uniformly and regularly, since there is less compression of the capillaries in the alveolar walls, and the mutual pressure of the inflammatory products is less. In infants who have died with this form of pneumonitis, of six or eight weeks' duration, it is not unusual to find the affected lobules still in the stage of red hepatization. Cell proliferation occurs in the bronchioles of the inflamed lung as in the alveoli, producing within them numerous plugs, which, though they obstruct the entrance of air, are not so firm as in croupous pneumonitis, as they are destitute of fibrin.

In favorable cases the lung affected by catarrhal inflammation returns to its normal estate, probably by the same process as in croupous pneumonitis. In other cases, especially in scrofulous and feeble children, the inflammation instead of resolving passes into what is now designated cheesy, or by certain writers scrofulous, pneumonitis.

CHEESY PNEUMONITIS.—Cheesy degeneration of the inflammatory product occasionally occurs in the croupous form of inflammation, but it is more common in the catarrhal. I have most frequently observed it in New York during epidemics of measles, when this form of pneumonitis supervened upon the catarrhal bronchitis of that disease. Cheesy pneumonitis is in its nature chronic, and attended with great reduction of the vital powers.

Cheesy degeneration of the exudate or infiltrate consists essentially in the absorption of the liquid portion, and fatty degeneration of the solid. The obstruction of the circulation in the capillaries and the accumulation of cells in the alveoli and bronchioles which cannot be expectorated, are conditions which favor the cheesy metamorphosis. The appearance and consistence of the lung when it has undergone this change are well expressed by the term which is employed to designate it. The cheesy mass consists of fatty, shrivelled, and fragmentary cells, and amorphous matter, in which can be traced the elastic fibres and larger vessels of the parenchyma, the other histological elements having disappeared.

The caseous mass after a time softens, attracting moisture from the surrounding tissues. The molecular detritus and the shrivelled cells are now suspended in a liquid, and, like any dead matter, they are irritants to the surrounding lung substance. The bronchial tube which supplies the diseased lobule, and which in many instances was the starting-point of the disease, again becomes pervious, either by softening of the plug or by ulceration at a higher point upon its walls, and air is admitted, which promotes the putrefactive process and chemical changes of the caseous substance.

The lesion now described is that of pulmonary consumption, a disease not infrequent in children of two or three years. There are as yet no tubercles, but the presence of softening caseous material in the lungs very frequently leads to their development (see Art. Tuberculosis), and accordingly, before the case ends, clusters of tubercles may appear in the connective tissue and walls of the vessels of the lungs and in other organs.

In the subsequent progress of cheesy pneumonitis, if the patient live sufficiently long, there occurs more or less expectoration of the offending substance, producing a cavity. Around the cavity a vascular pyogenic membrane forms, upon which granulations arise. These granulations, which produce pus abundantly, and from which small extravasations of blood are frequent, are gradually transformed into connective tissue. If the dead portion is expectorated, and there is a single small cavity, the child may recover, the empty space being finally filled up by the extension of the granulations, and the production of a cicatrix, which contracts, producing a puckered appearance. Ordinarily, however, there are several depots of cheesy matter, and several cavities resulting, which continue to enlarge by the continued softening of cheesy matter in their walls. Often, also, certain of the cavities intercommunicate. The bronchial glands undergo hyperplasia, and certain of them are apt, also, to become cheesy. As the disease advances, the suppuration and expectoration increase. The fatal result occurs sooner in children than in adults, and, therefore, the lesions, destructive and inflammatory, observed at autopsies, are ordinarily not so far advanced in the former as in the latter. Other unfavorable changes may occur in the hepatized lung, but cheesy degeneration is the most common and noteworthy.

Whether it is possible to inflate a lung which presents to the naked eye the appearance of pneumonitis, has long been regarded as a reliable sign of the presence or absence of inflammatory consolidation. The facts as regards the possibility of insufflation are these: In croupous pneumonitis, when it has passed beyond the first stage, insufflation is impossible in the lung of the child as well as adult, with the utmost force of the breath. We produce emphysema in healthy portions of the lungs, while the inflamed area is not encroached upon.

On the other hand, in catarrhal pneumonitis, which we have seen is the common form of pulmonary inflammation in children under the age of five or six years, and in which there is less distension of the air cells by inflammatory products, the lung can be inflated, except in protracted cases, but when fully inflated the solidified lobules can still be felt between the thumb and fingers. In protracted catarrhal pneumonitis, as well as in protracted collapse, which, indeed, may and often does become a pneumonitis, full inflation is impossible. Central portions still remain impervious to air. While, therefore, the possibility or impossibility of inflating a lung removed from an adult, and which presents to the naked eye the appearance of pneumonic solidification, is a valuable sign as indicating whether or not the disease was pneumonitis, in the child little importance can be attached to it.

SYMPTOMS.—Croupous pneumonitis commonly begins abruptly, or it is preceded for a brief period by symptoms of a cold. In the adult, the abrupt commencement is ordinarily with a chill. In the child, there is often a sensation of chilliness, but a distinct chill is not common. Convulsions sometimes occur in place of a chill. Catarrhal pneumonitis, being ordinarily a secondary disease, begins in a more gradual way, its symptoms being preceded by, and associated with, those of the primary affection.

The symptoms of acute pneumonitis, whether catarrhal or croupous, are the following: Anorexia, thirst, restlessness, elevation of temperature, acceleration of pulse according to the intensity of the inflammation and the feebleness of the patient, flushed face, a countenance indicative of suffering, accelerated respiration, with an expiratory moan. These symptoms are constant in the acute inflammation unless of the mildest form. Those which are important I shall describe more fully.

The expiratory moan is described by writers as a pathognomonic symptom of this disease, or of pleurisy. It is evidently due to the pain experienced by the friction of the inflamed pleura. As a rule, the expiratory moan does indicate either pneumonitis or simple pleuritis; but there are exceptions. It may occur, for example, from indigestible substances in the stomach and intestines, giving rise to acute dyspepsia; or from certain forms of abdominal inflammation, which render movements of the diaphragm painful.

The cough in the first days of pneumonitis is often dry or hacking and painful. It afterwards, if the case is favorable, becomes looser, and is painless. We very seldom observe in the child the bloody sputum which characterizes pneumonitis in the adult, since in catarrhal inflammation there is little or no exudation of blood corpuscles. The sputum, which in this form of the disease is the product of secretion and cell proliferation, is at first thin and frothy, but afterwards thicker and less tenacious from the greater number of cells. There is often, in the first period of the inflammation, pretty severe and constant headache, the patient complaining of the head, if old enough to speak, before he does of the chest. In a severe attack the child at this period lies with the eyes shut, apparently in a half-conscious state, fretful if spoken to or aroused, so that the physician might be led to suspect the presence of cerebral disease. If there is vomiting, accompanied with sudden twitching of the muscles, and convulsions—symptoms which sometimes occur—the liability to error in diagnosis is greatly increased. Cerebral symptoms are more prominent in the commencement of pneumonitis than subsequently. As the disease advances they subside, and symptoms referable to the chest become more conspicuous.

The breathing is, as I have said, accelerated. Thirty or forty respirations per minute are common, and, in severe cases, the number reaches sixty or even eighty. In infants there is greater frequency of respiration than in children. In those at the breast, if the dyspnœa is urgent, nutrition is sometimes seriously interfered with, since in these severe cases respiration is performed more through the mouth than nostrils, so that if the infant seizes the nipple, it is forced to relinquish it in order to breathe. Dilatation of the alæ nasi, and depression of the infra-mammary region, accompany inspiration. The dyspnœa in catarrhal pneumonitis is often due in great part to accompanying bronchitis.

The temperature in mild cases of pneumonitis is elevated to about 101° to 103°; in severe cases it may reach 105° or even 107°, the former being the highest observed by Mr. Squire. In ninety-seven observations made by M. Roger, the average temperature was 104° during the active period of the inflammation. The face is therefore flushed, and the heat of surface pungent, except in weakly children, in whom, even in severe and active inflammation, the face is sometimes pale, and the extremities of natural or less than natural temperature.

The tongue is moist, and covered with a light fur; the thirst is such that nutriment may be given in the form of drinks, when the loss of appetite prevents the use of solid food. The bowels are usually constipated. The secretions, in the first and second stages, are diminished. The urine is more deeply colored than in health, and in vigorous patients it deposits urates on cooling. The chlorides are also deficient, or absent from the urine, as long as the inflammation is extending.

In favorable cases, in from seven to ten days the heat and thirst decline; the pulse and respiration gradually become less frequent; the cough looser; the features have a more placid or contented expression; the appetite returns, and the patient is again amused by playthings. The improvement is progressive, but gradual. A slight cough is occasionally observed for two or three weeks after convalescence is fully established.

Death in the acute stage of the inflammation commonly occurs from asthenia. The pulse gradually becomes more frequent and feeble, the respiration more oppressed, and finally, as death approaches, the face and extremities become cool. Occasionally death results from apnœa, due in great part to coexisting bronchitis. In exceptional instances it occurs from convulsions, followed by coma, especially in the first week. Death, in those protracted cases in which the inflammatory products have undergone cheesy degeneration, is usually from asthenia.

Such are the symptoms and progress of ordinary acute pneumonitis in children. When the inflammation is subacute, as in those forms of the disease which result from collapse or hypostasis, the symptoms are less pronounced. The respiration in such cases is but moderately accelerated, is attended by little pain, and therefore the expiratory moan is often absent. An occasional short, dry cough occurs, with so little increase of temperature and quickening of the pulse that the pneumonitis is apt to be overlooked by the physician, the symptoms being referred to bronchitis. Pleuritis does not occur in connection with this form of pneumonitis, except when a small abscess or gangrene occurs in an affected lobule directly under the pleura. A few such cases I have observed.

Tubercular pneumonitis extends over much or little of the lung according to the amount of tubercles. The symptoms are like those of severe primary pneumonitis, superadded to such as pertain to tuberculosis. This inflammation, when once established in the consumptive child, commonly continues till the close of life. I have sometimes had these cases under observation for several consecutive weeks, even months, and during the whole time there was not only acceleration of pulse and respiration, but the expiratory moan. As regards pneumonitis occurring in hooping-cough, it is an interesting fact that its symptoms modify those of the primary disease, so that, during the active period of the inflammation, the paroxysmal cough diminishes, and a short, hacking cough and expiratory moan occur in place. As the inflammation abates, the spasmodic cough returns. Pneumonitis, occurring in measles, is more obstinate, protracted, and dangerous than the primary form. It usually commences about the period of the decline of the eruption, and, in favorable cases, continues two or three weeks. It is then a sequel, rather than complication.

PHYSICAL SIGNS.—The physical signs of pneumonitis in infancy and childhood are the same as in the adult, but in a large proportion of cases they are less distinct. In a majority of patients under the age of three years the crepitant râle is not observed. This is due to the small size of the air vesicles at this age. I have now and then detected it in quite young children, in whom it is a finer râle than in the adult. If observed, it is, of course, positive proof of the existence of pneumonitis. The physical signs, therefore, in the first stage of the inflammation are often obscure in consequence of the absence of the pathognomonic râle. The vesicular murmur is somewhat intensified through the chest, and there is in this stage slight dulness on percussion over the seat of the inflammation due to engorgement of the vessels, but it is difficult to appreciate this.

In the second stage, which supervenes more or less rapidly, the physical signs are more distinct. Bronchial respiration is in most cases detected, higher in pitch than the vesicular murmur, with the sound of expiration higher than that of inspiration. The voice of the patient is transmitted to the ear applied over the seat of the disease, and often a peculiar vibratory sensation is communicated to the hand applied over the part, so that it is possible to locate the disease by palpation alone. There are frequently, in the second stage, and sometimes in the first, coarse mucous râles in various parts of the chest from coexisting bronchitis.

Percussion, in the second stage, elicits a dull sound as compared with that produced on the opposite side of the chest. The dulness corresponds in extent with the solidification, and with the bronchial respiration.

As the inflammation abates, the dulness on percussion gradually diminishes, and the bronchial respiration is succeeded by the subcrepitant râle. Often, for a considerable period after convalescence is established, moist râles are observed in the chest, and sometimes the dulness on percussion does not entirely disappear till after the health is fully restored.

In catarrhal pneumonitis the physical signs are not so distinct. This is due in part to the limited extent of the inflammation, in part, in many cases, to its subacute character, and in part to the fact that this inflammation is apt to be double, especially in those frequent cases in which the cause of the disease is hypostatic congestion.

DIAGNOSIS.—In the adult, pneumonitis is a disease of easy diagnosis. In infancy and childhood, on the other hand, diagnosis is often difficult. Acute primary pneumonitis in young children is apt to be confounded with meningitis or one of the essential fevers if the examination be made within the first or second day. In children over the age of three or four years, it is most frequently mistaken for remittent fever. The two diseases do, as regards symptoms, resemble each other. Both are characterized by great elevation of temperature, rapid pulse, languor, and drowsiness, and in both there is apt to be a cough even from the first day. But remittent fever (I include for the present under this term also typhoid fever) usually begins more gradually than pneumonitis. It is preceded for a few days by symptoms of mild indisposition, though there are exceptions, and it may commence quite abruptly. The expiratory moan occurring in pneumonitis in most cases by the second or third day is a symptom of great diagnostic value. But positive proof of the nature of the disease is afforded only by auscultation and percussion. Scarlet fever, in its commencement, bears some resemblance to acute primary pneumonitis. The points of differential diagnosis are the redness of the buccal membrane and the fauces, and the efflorescence upon the skin in scarlet fever on the one hand, and on the other the rational and physical signs of pneumonitis, which have been described.

Greater difficulty attends the diagnosis of acute pneumonitis from bronchitis and pleuritis. The presence of the expiratory moan, if it is pretty constant and marked, is sufficient to exclude bronchitis, unless as a complication, but the physical signs constitute the only reliable means of exact diagnosis. The presence or absence of bronchitis is readily determined by auscultation. The physical signs should be carefully noted, in order to determine if there is some point of solidification.

Solidification gives rise to dulness on percussion, bronchial respiration, and bronchophony. These three signs coexisting afford sufficient proof of pneumonitis, unless there is tubercular consolidation or possibly collapse supervening on suffocative bronchitis. The history of the case aids in determining whether there is either of these diseases. Moreover, collapse occurs later after the attack commences than hepatization, and does not produce so distinct bronchophony or bronchial respiration as are observed in the common form of pneumonitis.

Pleuritis with effusion may present physical signs which bear considerable resemblance to those in pneumonia; but in pneumonia, except when associated with tubercular deposit, the dulness on percussion is not so great as that from pleuritic effusion, nor does the line of dulness vary according to the position of the child. In pleuritic effusion in a young child, the respiratory murmur can often be heard with the ear applied over the liquid, but it is indistinct, and transmitted through the liquid from a distance. The practised ear is able to discover the difference between it and the bronchial respiration of pneumonitis. Attention to these facts enables us to make a positive differential diagnosis in most cases. Occasionally the physical signs indicate the coexistence of pneumonitis and pleuritis.

In catarrhal pneumonitis, it is often difficult to determine certainly the nature of the disease, since the physical signs, if there is but little extent of inflammation, are absent or indistinct. I have often, in post-mortem examinations, found so small a part of the lung hepatized that it could not possibly have produced any appreciable dulness on percussion, bronchial respiration, or bronchophony. Such cases are apt to pass for bronchitis, and, practically, this matters little, since the treatment required by the two is not dissimilar.

PROGNOSIS.—Primary pneumonitis, affecting only one lung, if properly treated, in most instances terminates favorably in children, and even in infants. If double, it is, as in the adult, much more serious, and, in a large proportion of cases, fatal. Secondary pneumonitis, pneumonitis occurring in measles, hooping-cough, tuberculosis, or resulting from hypostatic congestion in the course of some exhausting disease, is, on the other hand, more frequently fatal. As death usually occurs from asthenia, the younger the child, and more feeble the constitution, the greater the danger.

Unfavorable symptoms are a pulse becoming more and more frequent and feeble, pallor of countenance, inability of the patient to support the head, total loss of appetite, refusal to notice or be amused by playthings, absence of tears when crying—a symptom which the French writers have pointed out—and the appearance of pemphigus on the face or elsewhere.

Indications on which a favorable prognosis may be based are moderate acceleration of pulse, pneumonitis primary and limited to one side, ability to support the head or sit erect, being amused by playthings, etc.

TREATMENT.—The treatment of the two forms of pneumonitis, croupous and catarrhal, the former for the most part primary and acute, and the latter secondary and often subacute, requires to be considered separately, as much as do their symptoms and anatomical characters. In *croupous* pneumonitis, if seen at the commencement or within a few hours of the commencement, an emetic of ipecacuanha may be given, as recommended by Trousseau. This acts promptly as a cardiac sedative, diminishing somewhat the afflux of blood towards the lungs, and moderating the inflammation. It should never be employed except at the period mentioned.

If the previous health of the patient has been good, his age above three years, and if the inflammation is, in part at least, in the first stage, aconite or veratrum viride, properly employed, is serviceable. Either one is an efficient substitute for bloodletting. Some prefer aconite as less depressing than veratrum, and it is known to be a favorite remedy of homœopathists. I have ordinarily employed the veratrum, prescribing the tincture in doses of one drop every three hours to a child of five years. It can be given dropped in sweetened water or in the syrup of tolu. Its effect should be carefully watched, and it should be omitted, or given less frequently, when the pulse is reduced to near the natural frequency. The pulse should be maintained two or three days, dating from the commencement of the attack, at about its natural frequency, but never below it.

If bronchial respiration, bronchophony, and dulness on percussion are present, indicating the second stage; in other words, if it appear from the signs that the inflamed lobe or lobes are hepatized, little benefit accrues from the use of so powerful a sedative, and much harm may be done. When this medicine is discontinued, or without its use, if the physician is not called till the stage of hepatization, a minute dose of tartrate of antimony and potassa should be prescribed in the class of cases to which I allude. It may be advantageously combined with sulphate of morphia, if the respiration is painful or cough troublesome. The following formula I have sometimes employed with a satisfactory result, for a child of five years:—

℞. Morph. sulph.,
Antim. et potas. tart. āā gr. j;
Syr. bal. tolut. ℥iv. Misce.

Dose, one teaspoonful from two to four hours. In place of this, Dover's powder may be administered in combination with nitrate of potash. There soon arrives a period when depressing remedies should be omitted. Many now recover with simple mucilaginous drinks or mild expectorants, like syrup of squills or ipecacuanha in small doses. Others require more sustaining measures, and for such carbonate of ammonia with the syrup or decoction of senega is preferable.

The treatment described above is proper only for robust children with primary pneumonitis. In no other cases are measures so depressing required. There can be no doubt that the great error, in the therapeutic management of children with this disease, has been the employment of medicines which reduced the strength, when gentler measures, or those of a sustaining nature, were required. In secondary pneumonitis or primary if the patient is pallid, scrofulous, or at all wasted, or under the age of three years, neither aconite, veratrum viride, nor antimony should be given. Such cases require milder therapeutic agents, as syrup of squills or ipecacuanha in the first stages, and, subsequently, carbonate of ammonia with senega. Some are best treated with ammonia and senega from the commencement.

The bowels should be kept open, as an important part of the treatment of croupous pneumonitis in its first stages. A small dose of castor oil, Rochelle salts, or citrate of magnesia should be given if there is any tendency to constipation, and repeated from time to time if required. A saline aperient by its derivative and refrigerant effect in some cases obviates the necessity of employing cardiac sedatives.

Local treatment is required in all cases; counter-irritation should be produced as soon as possible over the inflamed lobe, by mustard, iodine, or some stimulating liniment, and, except at the time of this application, the chest should be constantly covered with an emollient poultice, or with a cloth wrung out of warm water and covered with oil-silk. I prefer, however, the constant application, under the oil-silk, of the following poultice, made large but thin as the cover of a book and therefore light.

℞. Pulv. sinapis. ℥ss;
Pulv. semin. lini ℥viij. Misce.

In a large proportion of cases, vesication is not required. If the inflammation is extensive, and the symptoms urgent, it is occasionally advisable to blister, and the cantharidal collodion should be used for this purpose. A safe, almost painless, and at the same time efficient, mode of applying this is in spots as large as a ten cent piece, half a dozen, more or fewer according to the extent of the inflammation, the skin of course remaining sound between them. This mode of application obviates the danger of producing a troublesome sore, which sometimes occurs in children from the ordinary mode of vesication.

The diet should be nutritious, consisting of animal broths and the like, unless during the first three or four days, in robust children.

In those few cases of croupous pneumonitis which occur in young children, no remedy should be employed more depressing than ipecacuanha, perhaps combined with some aperient like castor oil, as in the formula recommended in the treatment of bronchitis.

Before leaving the subject of the therapeutics of pneumonitis, I desire to impress upon the reader the paramount importance of ascertaining fully, before he prescribes, not only the extent and stage of the inflammation, but especially the condition of the patient's constitution. For many cases require sustaining measures from the first, and, without a proper appreciation of the patient's state, the medicines ordered may be highly injurious instead of useful.

Catarrhal pneumonitis requires somewhat different treatment, not only because it occurs chiefly in infancy and early childhood when there is little vigor of constitution, but because it is as a rule secondary. In acute catarrhal pneumonitis, which, as we have seen, in most instances results from an active bronchial inflammation, the treatment already employed for the primary disease should be continued. (See Art. Bronchitis.) If there is pain or restlessness, a little opiate should be added. In subacute forms of the disease, and in the acute when it has continued a few days, sustaining and even stimulating measures are indicated; carbonate of ammonia with some tonic is useful in such cases.

In *cheesy* pneumonitis, or in protracted catarrhal pneumonitis which may or may not have become cheesy, carbonate of ammonia in combination with citrate of iron and ammonia, equal parts, or cod-liver oil to which two or three drops of syrup. ferri iodidi are added, will be found useful, as are also alcoholic stimulants. Nutritious diet is required in all cases of catarrhal pneumonitis. The local treatment should consist of an oil-silk jacket and counter-irritation, as recommended in the treatment of croupous pneumonitis, without vesication. In case of hypostatic pneumonia the position of the patient should be frequently changed.

CHAPTER VI.

PLEURITIS.

Pleuritis occurs both as a primary and secondary disease. If we except such cases as are due to pneumonitis and tubercles, secondary pleurisies are more common in children than in adults.

CAUSES.—The ordinary cause of primary pleuritis is the same as that of most primary inflammations, namely, the impression of cold. It is therefore most common in the cold months, and in times of changeable temperature. Cachexia is a predisposing cause. Therefore, children whose blood is impoverished by the anti-hygienic conditions in which they reside, or by previous disease, are more liable to it than those who have robust constitutions. Hence, also, its frequency among foundlings and the children of the city poor.

The causes of secondary pleuritis are quite numerous. The most common, after the age of three years, are tubercles, pneumonitis, and scarlet fever. Tubercles cause pleuritis by their irritating effect upon the pleura, and of course only those tubercles can produce this result which are seated directly underneath this membrane. Pneumonitis causes pleurisy by extension of the inflammation. Scarlet fever gives rise to it indirectly as a sequel. In a certain proportion of cases of this exanthem, during the period of desquamation or convalescence, active congestion or inflammation of the kidneys occurs, giving rise to uræmia. Urea in the blood is an irritant to serous structures, and hence is a not infrequent cause of pleuritis.

In the infant many cases of pleuritis are due to the escape or discharge into the pleural cavity of some pathological product, usually pus, softened tubercle, or decomposed lung tissue. This substance is an irritant, and it produces acute and often general pleuritis. A very small amount of pus or softened tubercle, or of decomposed lung escaping into the pleural cavity, gives rise to violent and fatal pleurisy. I have made post-mortem examinations of several such cases.

A retro-pharyngeal abscess in rare instances descends behind the pharynx and œsophagus, and opens into one of the pleural cavities, causing fatal pleuritis. A suppurated bronchial gland, or an abscess in the walls of the chest, occasionally produces the same result. In January, 1864, I presented to the New York Pathological Society the lungs of an infant with the following history: R., nine months old, of German parentage, family scrofulous. Its own health was good prior to the sickness of which it died, and it was fleshy. The only other child in the family, a girl, had suffered from strumous ophthalmia and strumous periostitis of the tibia. This infant was taken sick about December 19th, 1863, with moderate febrile movement and restlessness, but apparently without any serious indisposition. On the 22d of December, the mother called my attention to a prominence just below the right clavicle. This proved to be an abscess. A poultice was applied, in the expectation that it would discharge externally. On the 24th of December, however, the prominence subsided, and immediately the symptoms were greatly aggravated. The pulse rose to 160 per minute, the respiration to 60 or 80, and expiration was accompanied by a moan, so common in acute inflammation of the pleura or lung. Within a day or two after the disappearance of the tumor, and the exacerbation of the symptoms, dulness on percussion was observed on this side, and this increased till there was perfect flatness. The right pleural cavity had evidently filled with liquid, the acceleration of pulse and respiration continued, the patient grew more and more feeble, and death occurred December 31st.

At the autopsy, on dissecting away the integument from the right side of the chest, an abscess was opened, containing nearly an ounce of pus, located at the point where the tumor had been observed. There was a small round opening from this abscess directly into the cavity of the chest, so that, on depressing the ribs, liquid escaped from the cavity. On removing the sternum, the liquid was found to consist mainly of serum with lymph, and at the bottom of the liquid was considerable pus. I have met one other case, apparently almost identical with this, the infant being seven months old, but I did not attend it in the latter part of its sickness. The abscess in the case which I have detailed was obviously strumous, probably occurring from glandular inflammation. This mode of production of pleuritis, namely, by the discharge of an abscess located in the thoracic walls, is no doubt rare. It was so considered by the members of the Pathological Society. Pleuritis, which is a common accompaniment of croupous pneumonitis, is not common in the catarrhal form of the disease, and therefore cases due to pulmonary inflammation are less frequent in children than in adults. But inflammation of the pleura occasionally occurs in catarrhal pneumonitis in the following manner: Little abscesses are produced in the solidified lung, containing from one or two to as many as fifteen or twenty drops of pus, as has been stated in our remarks on pneumonitis. The pus, approaching the pleural surface, produces circumscribed pleuritis at that point, or, opening into the pleural cavity, it gives rise to general pleuritis, with or without pneumothorax. The following cases, among others which I could present, established this point. These cases are also interesting, as showing the occasional latency of pneumonitis.

CASE 1.—I. M——, male infant, was admitted into the Nursery and Child's Hospital, May 19th, 1859, at the age of two months. He was very delicate at the time of admission, and had slight bronchitis, but, being placed with a wet-nurse, he gradually improved. About the middle of July, attacks of diarrhœa occurred, each lasting from one to two days, and from this time his health declined. Furuncular eruptions appeared on the head and neck, and, though sustaining measures were employed with medicines to control the diarrhœa, there was progressively more emaciation and feebleness.

The records on August 1st state, "Continues to fail, apparently from the attacks of diarrhœa; the furuncular eruption continues." On the 3d of August, he died suddenly of apnœa, though there had been no symptoms to direct attention to the chest. Possibly he had a slight cough, which had escaped detection.

Autopsy eight hours after death.—Stomach and jejunum healthy; mucous membrane lining the lower part of the ileum and the entire colon vascular, and that of the colon considerably thickened; mesenteric glands enlarged, and of a lighter color than in health; right lung compressed by a sero-fibrinous exudation, so as to occupy a small space, though the amount of liquid was not more than two ounces; nearly the entire pleura, visceral and parietal, on this side was covered with a fibrinous deposit of a creamy appearance. Some of this had settled in the depending portion of the cavity. This lung could be inflated, except a little of the lower lobe, which was hepatized.

On the left side, the lung also occupied a very small space, being collapsed; the upper lobe could be readily inflated when it had the elasticity of healthy lung; the lower lobe had a healthy appearance, and could be inflated, except a portion in the posterior aspect measuring, perhaps, an inch in diameter; this was partially coated with lymph, and was found to contain two small abscesses, one closed, the other opening externally on the surface of the lung and internally into a bronchial tube. On attempting inflation, the air passed directly through this opening. The closed abscess contained from one-third to half a drachm of pus corpuscles, and disintegrated lung tissue, as shown by the microscope. The child was much emaciated.

CASE 2.—M. I——, female, was admitted into the Child's Hospital October 7th, 1859, at the age of about four months; at the time of admission, was somewhat wasted with diarrhœa; her health improved partially, but she remained feeble, and was at times much troubled with meteorism which occasioned pain.

On the 2d of November, she was suddenly seized with great dyspnœa, which terminated fatally in about a quarter of an hour. Previously to the dyspnœa, no cough had been noticed, or other symptoms referable to the chest.

Autopsy.—Body considerably emaciated; left lung healthy, with the exception of slight hypostatic congestion; right lung adherent to the diaphragm, and to a considerable part of the costal pleura, by fibrinous exudation; this lung was somewhat compressed and non-crepitant; the upper lobe floated in water; the middle and lower sank and could not be inflated, or but slightly; this portion of the lung contained a few small abscesses, filled with purulent matter, each holding scarcely more than one drop; two of these seemed to have discharged into the pleural cavity, as the air passed through them in attempting to inflate, but possibly they may have been opened in separating the adhesions which united the two pleural surfaces at this point; two or three ounces of fluid were contained in the pleural cavity, consisting, in addition to serum, of fibrinous flocculi, epithelial cells from the pleura, pus cells, and compound granular cells: the lower portion of this fluid, on standing, contained so much pus that it presented the characteristic gelatinous appearance on the addition of liquor potassæ; the other organs generally were normal in appearance, but the liver was somewhat congested, and there was also decided hyperæmia of the mucous membrane of the colon near the ileo-cœcal valve, and in the descending portion.

In cases like the above, the pleuritis is obviously due either to the escape of pus from the lung into the pleural cavity, or to its near approach to the pleura. In the former case the inflammation is apt to be general; in the latter circumscribed. The above cases are interesting, as showing an occasional result of circumscribed pneumonitis in the infant, namely, hydrothorax in addition to pleuritis.

Sometimes, especially in young children, the cause of the pleuritis is apparently general, or constitutional, but is obscure. Thus, at the autopsy of an infant who died at the age of about one month in the Infant's Service of Charity Hospital, in 1867, a small amount of pus, not more than a drachm, was found in one pleural cavity, and less than this quantity in the other. On both sides there was nearly general injection of both the visceral and costal pleuræ, but without exudation of serum or fibrin. There was pus also at the roots of the lungs, extending somewhat over the lungs but under the pleura. The fact of a double pleurisy appeared to indicate a constitutional cause, but there was no apparent cause of this nature except cachexia, to which allusion has already been made, as predisposing to this form of inflammation.

Anatomical Characters.—The first appreciable structural change which occurs in pleuritis is engorgement of the vessels lying underneath the pleura. There can be seen, if an opportunity is presented, as in the case detailed above, a network of engorged capillaries. Immediately exudation commences into the connective tissue surrounding the capillaries, the pleura becomes opaque, and liquor sanguinis escapes on its free surface. The amount of serum and fibrin which is exuded into the pleural cavity varies greatly in different cases, as does their relative proportion.

In pleuritis due to the irritation of tubercles, or to extension of inflammation from an inflamed lung to the pleura which covers it, the amount of serum is ordinarily small, and occasionally almost entirely absent, so that the visceral and costal surfaces remain in contact. In other cases, namely, when the pleuritis is idiopathic, or due to uræmia, or to a foreign substance in the pleural cavity, the amount of serous effusion is considerable, producing more or less compression of the lung. The most frequent exceptions to these general statements I have observed in the pleurisy of tuberculosis in infants, in which form of the disease the lung is not infrequently somewhat compressed by the liquid.

Ordinarily the fibrin forms a layer over the inflamed pleura, at first soft and readily detached, but gradually becoming firmer, and shreds or flocculi of fibrin, becoming separated, float in the exuded serum. When the inflammation has continued a short time, granulations appear on the inflamed surface, receiving their supply of blood from the sub-pleural capillaries, which have been prolonged. These granulations, when the serum is absorbed, uniting with those on the opposite side, form permanent adhesions.

Pleuritis, except when due to a local cause seated beneath the pleura, as tubercle or pneumonitis, extends rapidly, soon becoming general.

In a certain proportion of cases empyema occurs. The proportion of pleurisies in feeble and ill-conditioned infants which are or become suppurative is very large. Hence empyema, as I have often noticed, is not infrequent in the institutions of this city where such infants are treated. As, in recent fatal cases, we find the exudation mainly sero-fibrinous, and empyema in those who have lived a month or more, it has seemed to me that the suppuration is probably referable to the irritating effect of the fibrin, which, liquefying, and not absorbed on account of the general feebleness, acts as an irritant, and provokes a suppurative inflammation.

Pleuritis has, for convenience of description, been divided into three stages: the first, extending from the commencement of the inflammation to the time when there is an appreciable amount of exudation; the second, from the time that the exudation is appreciable to the commencement of absorption; the third stage is that of absorption or convalescence. Absorption commences when the inflammation abates, and the rapidity with which the fluid disappears varies greatly in different cases. As absorption occurs, the compressed lung gradually expands to occupy the place of the fluid. Sometimes absorption occurs more rapidly than the expansion, so that there is depression for a time of the thorax on the affected side, which gradually disappears. The serum is first absorbed, and then the fibrin, undergoing fatty degeneration and liquefaction, is also absorbed. Occasionally portions of the fibrin instead of being absorbed undergo calcification, after which there is no farther change. Commonly, as the serum is removed the two pleural surfaces become permanently adherent, and the lobes are likewise united to each other.

In rare instances, in which there is a large amount of serous exudation, producing complete carnification of the lung, and absorption is slow, inflation never occurs, and the ribs of the affected side are permanently depressed. Respiration henceforth is performed entirely by the other lung, which increases somewhat in volume by hypertrophy of the air cells. The compressed lung remains non-crepitant and firm, and its color somewhat lighter than the natural hue, from defective supply of blood and granular change in its anatomical elements.

In empyema, absorption obviously cannot occur unless the quantity of pus is small. Empyema, therefore, except when relieved by paracentesis, is a lingering disease, attended by many of the symptoms of tuberculosis. Spontaneous cure occasionally occurs, by discharge of pus into a bronchial tube, or externally through the walls of the chest. I have witnessed both these modes of termination. In certain instances, pleuritis on the left side becomes complicated with pericarditis, and, more rarely, pleuritis in the lower part of the right pleural cavity, with perihepatitis, the inflammation extending in the one case through the pericardium, in the other through the diaphragm. I have met four cases of the former complication, and one of the latter in infants.

Symptoms.—Occasionally pleuritis is latent. This may be its character, both in the primary and secondary form, latency being more frequent in infancy than in childhood. The following is an example. A feeble infant, 5 months 28 days old, died suddenly at the Nursery and Child's Hospital, December 29th, 1870. The attention of the resident physician had not been called to it, as it was not supposed to be sick, although its general condition was bad, and the attendant nurse who had charge of the ward denied that there was any symptom, unless possibly an occasional slight cough in the last three or four days. Percussion over the right side of the chest of the corpse gave a flat resonance, and the right lung was found at the autopsy carnified and covered with a loose fibrinous layer, in places three-fourths of an inch thick.

As circumscribed pleurisy is for the most part a secondary disease, the symptoms which are present are due partly to it and partly to the primary affection. Obviously the symptoms vary in different cases, according to the presence or absence of other diseases, the age and robustness of the patient, and the extent of the inflammation. In most cases the commencement of pleuritis is indicated by increase in the frequency of the pulse and respiration, the expiratory moan, and sometimes by tenderness on percussion over the seat of the inflammation. There is a short cough, dry or hacking, unless bronchitis coexists, in which case there is more or less expectoration; at the same time, those symptoms are present which are common in all inflammatory affections, such as anorexia, thirst, and increase of temperature. The symptoms enumerated, though commonly so severe as to draw attention at once to the chest, are in other cases so mild, even when the inflammation is not latent, that they may be at first overlooked. There is, indeed, every gradation between severe symptoms and latency.

In acute general pleuritis the symptoms are commonly severe. The pulse rises to 130 or 140 beats per minute, and in young children it may be more frequent; the respiration is increased in a corresponding degree; the face is flushed and indicative of suffering; the patient is restless, complaining, if old enough to speak, of the stitch-like pain in the chest, which is most intense on inspiration and in coughing. The mean temperature, according to the observations of Mr. Squire, is 101° Fahr.

When exudation occurs the symptoms abate partially. The pulse and respiration are less frequent, though still accelerated, and the latter is less painful. Convalescence is more protracted in pleuritis than in pneumonitis. Several weeks frequently elapse before the liquid is fully absorbed, during which time there is more or less acceleration of pulse. The appetite and strength return gradually.

In suppurative pleuritis or empyema, the symptoms may not differ materially at first from those in the ordinary form of inflammation, but absorption does not occur, or there is but a slight degree of it, limited to a portion of the liquor puris. The pus produces the ordinary effects of purulent collections in the system, namely, loss of appetite, hectic fever, emaciation, loss of strength. No improvement occurs except by discharge of pus, when restoration to health is often rapid. In fatal cases of empyema the vital powers gradually yield, the pulse becomes more frequent and feeble, the face and limbs pale and cool, and death occurs from asthenia.

Physical Signs.—The physical signs vary according to the extent of the inflammation, and the amount of exudation. The friction sound is seldom observed in the infant, and it is less frequently heard in the child than in the adult.

Percussion, in the commencement of pleuritis, before there is any appreciable exudation, gives a negative result. If dulness is observed, it is due to coexisting disease, commonly pneumonitis or tuberculosis. In those cases in which no effusion of serum occurs, or in dry pleurisy, as it is termed, percussion at all periods of the disease gives only negative information, impaired resonance if present being due to the pulmonary disease, pneumonitis or tubercles, to which this form of pleurisy is commonly due. In a large proportion of circumscribed pleurisies the percussion sound is not materially affected.

If there is serous effusion, and this occurs in most pleuritic attacks which are not dependent on pulmonary disease, and some in which there is this dependence, percussion over the liquid elicits a flat sound, while the resonance above the level of the liquid is good, and occasionally even tympanitic. Flatness on percussion distinguishes pleuritic effusion from simple pneumonitis, since in pneumonitis percussion produces a dull, but not flat, sound. In young children in whom pneumonitis is catarrhal and limited to a part of a lobe, the difference is very marked. Change in the height of the flatness, according to the position of the patient, is observed in infancy and childhood, not less than in adult life.

When the second stage commences, and the pleural cavity contains more or less liquid, the respiratory sound often disappears from the part of the chest which is occupied by the liquid in children over the age of five or six years, but in a large proportion of cases in the first years of childhood, and usually in infancy, in which period the pleural cavity is small, respiration is heard with the ear applied over the liquid. It is transmitted from a distance. Its character is bronchial, broncho-vesicular, or even sometimes vesicular. It appears in certain cases, especially when vesicular, to be transmitted from the opposite side of the chest.

It varies in its intensity, according to the amount of the liquid and the strength and rapidity of the respiration. It sometimes, according to Rilliet and Barthez, partakes of the cavernous respiratory sound, so that, in the first case in which they observed this modification, their diagnosis was erroneous. There was complete restoration to health, with absorption of the fluid, although they had diagnosticated a cavity.

If there is a large amount of fluid and the lung is compressed at the top of the pleural cavity, bronchial respiration may be heard above the level of the fluid, in the infra-clavicular region. In the adult this is a common physical sign. Ægophony is occasionally observed in acute cases, in which there is a rapid and large effusion.

It is heard in the infra- and inter-scapular spaces. Its duration is commonly brief, disappearing in three or four days or even in less time. Bulging of the intercostal spaces and distension of the thoracic walls from the fluid are less frequent in young children, and especially infants, than in adults. In the infant, so readily are the lungs compressed, complete carnification is apt to occur, before the shape of the chest is materially altered. On account of these peculiarities as regards the physical signs and the mechanical effect of a liquid in the pleural cavity of a young child, physicians whose knowledge of pleuritic effusions is derived chiefly from the examination of adult cases are apt to err in diagnosis. Thus, in 1870 a carnified lung, covered with a thick pyogenic membrane from which granulations had arisen, was presented by myself to the New York Pathological Society, with the following history of the case. W., twelve months old at the time of death, was taken sick at the age of six months, with fever, and a cough, which was slight and not frequent. At about eight months he first came under observation. The infant was then small for its age, pallid and thin. The two sides of the chest measured the same, and on both sides the intercostal spaces were somewhat depressed, but percussion over the right side produced a flat sound, showing that the air was wholly excluded from the right lung. The respiration upon the affected side was bronchial and distinct. Two well-known physicians of this city, thorough in their examinations, and usually accurate in diagnosis, examined this case in reference to the propriety of thoracentesis, and both expressed a decided opinion that the pathological state was not a pleuritis, but either collapse or interstitial pneumonitis, one of them observing, as he thought, in addition to the physical signs already stated, bronchophony. The febrile movement was moderate, and no decided hectic was observed. Death occurred from exhaustion. At the autopsy about half a pint of thick pus was found in the right pleural cavity, producing complete carnification of the lung. The pus, which, considering the stunted growth of the child and small size of the pleural cavity, was considerable, had evidently lost part of the liquor puris by absorption.

The following case, which shows how deceptive the physical signs may be in young children in cases of suppurative pleuritis, will repay perusal, since the life of the patient depends in great part on a correct understanding of his condition, so that appropriate measures will be employed:—

CASE.—H—, boy four years four months old, was taken with scarlet fever in the latter part of May, 1868. It was severe, and was attended with inflammation of the glands and connective tissue of the neck, with suppuration on both sides. Purulent discharges from the abscesses continued through the month of June. The patient was gradually convalescing, when, about July 4th, pleuritis commenced on the left side, attended by the ordinary symptoms of acute forms of this inflammation. A few days subsequently, the pleural cavity was ascertained by physical examination to be about half full of liquid.

Towards the close of July, anasarca commenced about the ankles and gradually extended upwards. It was limited to the lower extremities, and to the abdominal walls, and by the middle of August became excessive. The thoracic walls and the upper extremities were somewhat emaciated, and the face was pallid and anxious.

On the 7th of August, a careful examination of the chest was made in reference to the propriety of thoracentesis. The intercostal spaces on the left side were not prominent, but rather depressed. Percussion over the lower third of the left pleural cavity elicited a flat sound, while above this the resonance was tympanitic. On account of the great restlessness of the patient, no useful information was derived from change of position. On auscultation distinct bronchial respiration was heard over nearly or quite the entire left side of the chest. The apex beat of the heart was on the right of the sternum. It was my opinion, as well as that of two other physicians, that the liquid was in process of absorption, and that the quantity present was not large. Thoracentesis did not, therefore, seem a proper measure.

The anasarca still limited to the lower extremities, and the abdominal walls continued to increase, and on the 25th of August, so great was the distension, that the skin broke in one or two places above the ankles. The mind remained clear, and the appetite was pretty good. Death occurred August 27th.

Sectio Cadaver.—Head not examined; abdominal and right pleural cavities contained no effusion, and were in their normal state, except that the latter cavity was somewhat encroached upon by the heart and mediastinum; a great amount of œdema in the lower extremities and in the abdominal walls; abdominal walls towards the spine about three inches thick, in consequence of œdema; right lung of good size, and presenting the ordinary appearance except a greater amount than usual of hypostatic congestion; about three pints of pus (laudable) in the left pleural cavity; left lung completely carnified and lying against the vertebral column, its size about that of an orange, and its surface covered with a dense layer of fibrin; heart displaced, as already stated, to the right, and a little downward, so as to compress and partially obstruct the circulation in the ascending vena cava; this vessel contained a continuous, firm and yellow fibrinous clot, nearly filling its calibre; the femoral vein, examined on one side, was found to contain soft and dark clots. Compression of the cava opposite the heart and the formation of clots had evidently given rise to the anasarca.

DIAGNOSIS.—This is in certain cases readily made, but in others, as we have seen, is attended with difficulty. It is more difficult in those under than over four or five years. Partial or circumscribed pleuritis, attended by little or no serous exudation, is more apt to be overlooked than other forms of the inflammation, but, as it is ordinarily due to graver disease of the lungs, its detection is not very important. The points involved in its diagnosis are acceleration of pulse and respiration, increase of temperature, expiratory moan, friction sound, and tenderness on percussion.

The diagnosis of acute general pleuritis in its commencement, before the stage of effusion, is attended with some difficulty. It is most likely to be mistaken for pneumonitis, since the prominent symptoms in the commencement of the two diseases are similar. There is, however, in pleuritis ordinarily greater acceleration of pulse and respiration, greater elevation of temperature, greater suffering, as indicated by the features, and a more decided expiratory moan. It will aid in the differential diagnosis, in children under the age of five years, to recollect that acute pneumonitis is in most instances preceded by bronchitis, which is not the case with acute pleuritis, except as a coincidence.

Pleuritis with effusion could only be mistaken for pneumonitis or hydrothorax. But the loss of resonance on percussion in cases of pleuritic effusion is much greater than when the lung is solidified from pneumonitis. The physical signs, which are involved in the differential diagnosis of these diseases in the adult, are important, also, for diagnosis in children, though, as we have seen, they are less constant and less reliable in young children than in adults. In children over the age of five years they are pretty uniformly present. The signs alluded to are bulging of the intercostal spaces, expansion and subsequently retraction of the chest, evidence of change in the height of the fluid, by change in the position of the body, no bronchophony and fremitus as in pneumonitis, etc. Hydrothorax in the child commonly results from one of the eruptive fevers, especially scarlatina, and its immediate cause is nephritic congestion or inflammation, or heart disease. Rarely it is due to obstruction in the pulmonary circulation, in consequence of enlarged bronchial glands. It is not, therefore, preceded nor accompanied by symptoms of inflammation referable to the chest, as in cases of pleuritic effusion.

Empyema may be diagnosticated from the fact that there is little or no diminution in the amount of liquid after several weeks have elapsed, and from the febrile movement, loss of appetite, flesh, and strength, which attend all large purulent collections.

PROGNOSIS.—Primary pleuritis, occurring in patients previously healthy, commonly ends favorably; but it is a serious disease if the general health has been much impaired. The prognosis is more favorable if, as is commonly the case with this form of pleurisy, the patient is over the age of three or four years.

Secondary pleuritis is, on the other hand, a grave affection, but the prognosis depends greatly on the character of the primary disease, and also on the age. Pleurisy resulting from and coexisting with pneumonitis commonly ends favorably even in quite young patients. Pleuritis arising from scarlet fever is apt to be suppurative, and is, therefore, a serious complication or sequel, but a considerable proportion affected with it recover under judicious treatment. The prognosis in tubercular pleuritis and pleuritis occurring from the escape of pus into the pleural cavity is obviously unfavorable.

Tubercular pleuritis may be temporarily relieved, but it is apt to return. Suppurative pleuritis, or empyema, is also an unfavorable form of inflammation, characterized by the chronicity and many of the symptoms of tuberculosis. It is in time fatal unless the pus is evacuated. On the escape of the pus, whether spontaneously or by thoracentesis, there is usually progressive and complete restoration to health. In case the pus is evacuated, the prognosis is better in children than in adults.

TREATMENT.—The indications of treatment are, in the commencement of the inflammation, to diminish its intensity, and relieve pain; at a later period, to promote absorption and sustain the vital powers.

Pleuritis is one of the few inflammations in early life in which the abstraction of blood may be proper. It may be stated as a rule, that loss of blood is not only not required, but is an injudicious measure in all secondary pleurisies, and in the primary form after exudation into the pleural cavity has occurred. It is a useful measure at the commencement of acute primary pleuritis occurring in a robust state of system. One or two leeches should be applied directly over the seat of the inflammation, and bleeding may be encouraged for two or three hours subsequently by the application of cloths wrung out of warm water. Unfortunately the physician is, in many cases, not called at this early period; or, if called, he fails to make the diagnosis till there are evidences of exudation.

After bleeding has ceased, or in subacute and secondary pleurisies without the employment of leeches, rubefacient applications should be made over the affected side of the chest, followed by a poultice, or flannel wrung out of warm water and covered with oil-silk. Moderate counter-irritation diminishes the pain, but vesication at this early period is injurious. A blister applied so near the seat of the inflammation may increase the afflux of blood towards it, and aggravate the disease.

Robust patients over the age of three or four years are benefited by the use of cardiac sedatives in the commencement of acute pleuritis. The tincture of aconite or of veratrum viride may be given, but its effects should be carefully watched, and it should be discontinued when the pulse is reduced to near the natural frequency, or when sufficient exudation has occurred to produce the ordinary physical signs of liquid in the chest. They should not be given in secondary pleuritis.

Opiates are required, as in other serous inflammations, according to the pain. Dover's powder, in doses of one to three grains, according to the age, may be given every three hours, or less frequently if the patient is inclined to sleep.

Such is the treatment required in the first stage of acute primary pleuritis, or that preceding the effusion. Secondary pleuritis requires fewer and less depressing measures. The appropriate treatment, in a large proportion of the cases of this form of the disease, consists in the use of an opiate, with rubefacient and emollient applications to the chest. Abstraction of blood, and powerful cardiac sedatives, as aconite and veratrum viride, are dangerous remedies in secondary pleurisies, and are almost never used.

Pleurisies dependent on pulmonary disease, which are circumscribed and attended with little serous effusion, require no other therapeutic measures than those already mentioned. The judicious use of opiates, and rubefacient and emollient applications, suffice for their treatment.

In the treatment of other forms of pleurisy, which are attended by more or less effusion of liquid into the pleural cavity, measures designed to remove this liquid are required when the inflammation has abated, and antiphlogistics are no longer appropriate.

Liquids in the great cavities are best eliminated by hydragogue cathartics and by diuretics. For children, however, already weakened by pleuritic inflammation, cathartics are usually too depressing unless for one or two days. Now and then a robust patient, over the age of five or six years, with pleuritic effusion, may be benefited by an occasional purgative dose of bitrate of potassa, or by from one-twelfth to one-sixth of a grain of podophyllin. But such cases are exceptional. In a majority of children the loss of strength resulting from cathartics more than counterbalances the good result from the liquid evacuations which they produce.

Diuretics, on the other hand, are efficient remedies, and upon them our chief reliance must be placed.

The diuretic from which I have seen better effects than from any other is iodide of potassium, but it should be given in large doses. In the adult I have observed rapid absorption of the liquid by the administration of from one to two drachms daily of this agent, given in doses of ten grains, and a child can take a proportionate dose. Two to five grains, according to the age, may be given every three hours. At the same time it is advisable to restrict the drinks.

At this stage of the disease counter-irritation is appropriate, either by rubefacients or vesicants. The preferable mode of blistering the child is, in my opinion, by cantharidal collodion applied as recommended in the treatment of pneumonitis.

In secondary pleuritis the diet should be nutritious, consisting largely of animal broths, through the whole period of the disease.

In primary pleuritis nutritious diet should be allowed after exudation has occurred. In some cases, more frequently in secondary than primary pleuritis, stimulants are required. In protracted pleurisy, or pleurisy occurring in a debilitated patient, tonics, both vegetable and chalybeate, are often serviceable, sustaining the strength while the process of absorption is going on.

Occasionally the measures which have been recommended above to promote absorption of the liquid in the pleural cavity do not have the effect which is desired. If there is no sensible diminution in its amount, and if the general health of the patient begins to fail, the performance of thoracentesis should be considered. We may accomplish by surgery what we fail to effect by therapeutic means. The following are the remarks by Prof. Flint, on this subject. They apply to thoracentesis in children as well as adults. (Flint's *Practice of Medicine*, 2d ed., p. 155.)

"Heretofore this operation was performed only as a *dernier resort*, under circumstances when little was to be expected from any measure. It was deferred as long as possible, sometimes on account of doubt as to the diagnosis, and because the perforation and introduction of air were supposed to involve danger of an increase of the inflammation. A considerable opening was necessary in order to give free exit to the liquid, and it was not easy to prevent the air from entering the pleural cavity. Objection to the operation on the score of diagnosis is now removed by our present knowledge of physical signs. Moreover, the operation has been divested of all severity, and the liability to the introduction of air has been provided against by the application of the suction pump, first suggested by Dr. Morill Wyman, in 1850, and since employed in a large number of cases by Dr. Bowditch. The introduction of air is not attended by the injurious effects formerly apprehended, but it is objectionable because the presence of air is an obstacle to the full expansion of the lung after the liquid is removed. Its introduction is prevented by the use of the pump in withdrawing the liquid. The operation is rendered trivial, because with the suction force of the pump a small exploring trocar suffices to make the puncture, which causes very little pain, and closes directly the canula is removed."

Dr. Bowditch had performed the operation one hundred and fifty times on seventy-five individuals prior to 1863, in the manner described above, and in twenty-nine of the patients recovery was apparently due to it. Prof. Flint has several times successfully performed the operation, using a small trocar and canula made to screw on the flexible suction tube of Davidson's syringe.

M. Guérsant describes his mode of performing thoracentesis, in the *Bull. Génér. de Thérap.*, Oct. 15, 1866. He generally "plunges in the instrument above the superior border of the tenth rib on the left side, and the eighth rib on the right, and at the junction of the posterior one-third with the anterior two-thirds of the intercostal space. He employs a trocar about two lines in diameter, and nearly two inches in length, curved like a tracheotomy canula and furnished with a flap of membrane over its external orifice. The child is placed upon its back, and firmly held, while the operator with his left hand draws upon the skin, and with his right inserts the trocar, with its concavity looking downwards so as to avoid injuring the lung. The membrane at the external orifice of the canula, being previously moistened, excludes the entrance of air. On withdrawing the instrument, the skin passes over the wound, and the parts unite by first intention, provided that the liquid is sero-fibrinous."

The following are my experience and views in reference to this operation. Thoracentesis is rarely required in the child except for empyema, and it should not as a rule be performed in less time than eight weeks after the commencement of the inflammation, so as to allow as much as possible of the liquid to be absorbed. If the health of the patient is but little impaired, it is proper to wait longer, for, if the effusion is largely sero-fibrinous, and the amount of pus small, recovery is possible by absorption, for a small amount of pus may be absorbed, the pus cells undergoing fatty degeneration and liquefaction. The operation can be best performed with the patient etherized, the point selected being a little below the lower angle of the scapula. The operation is no more difficult than the opening of any deep abscess, and it is not dangerous to the patient. The skin being drawn up a little, so that after the operation it will close the opening like a valve, an incision should be made through the integument, and then a medium-size trocar pushed through the walls of the chest into the cavity at the upper border of the rib. A trocar of medium size is preferable to one that is smaller, as the pus is often thick and would flow with difficulty. Or, without the trocar, the operation may be performed by the bistoury alone. The admission of a moderate amount of air into the pleural cavity in tapping for empyema does no harm, except so far as it prevents inflation, since the pleural surface with which it comes in contact is already a pyogenic membrane. When the pus ceases to flow, the curved end of a pocket male catheter may be introduced, and with the India-rubber syringe attached more pus can be removed. I prefer, however, to make the aperture sufficiently large, enlarging it a little if necessary with a bistoury, that it may remain as a fistulous opening from which pus continues to flow. The skin acting as a valve prevents the admission of air after the canula is withdrawn. If the discharge ceases after a day or two, the small quantity of pus remaining will commonly be absorbed. The injection daily into the pleural cavity, as long as the aperture remains, of a weak solution of carbolic acid, of the temperature of the blood, expedites recovery, but without this there is a gradual, though sometimes slow, convalescence.

Since the publication of the first edition of this book, thoracentesis has been performed in four children in my own practice, and in one at the Out-door Department at Bellevue. In four the apertures was left open, being covered with oakum, and allowed to drain, but in three of these pus soon ceased to flow. The five children operated on recovered gradually, though four of them were in a reduced state which involved immediate danger. In about the same period death occurred in nearly an equal number, in whom the operation was not performed, in consequence of uncertain diagnosis or for other reasons. The one of those operated on, in whom thoracentesis was longest deferred, was taken with pleuritis of the right side in April, 1871, and the pus was evacuated by the knife in September following, the trocar, which was introduced immediately afterwards, being of little use, as the pus escaped by its side. Although the general health of the child, which remained for a time precarious, is fully restored, there are evidences of incomplete inflation of the lung. These few cases, if they correspond, as I believe they do, with more ample statistics, show the urgent need of thoracentesis in the empyema of children, and the probability of a favorable result, even when it is performed under discouraging circumstances.

If the liquid removed by the operation prove to be sero-fibrinous, it is very important that no air enter the pleural cavity, as it would be likely to produce a suppurative inflammation. Therefore, the puncture of the walls of the chest should always be made with the trocar in those cases in which there is doubt as to the nature of the liquid, since the entrance of air can be most readily prevented when this instrument is employed. In certain cases, in which absorption is slow, and empyema is suspected from the symptoms, it is proper to ascertain the nature of the liquid by the exploring needle before instituting any operative procedure.

SECTION III.

DISEASES OF THE DIGESTIVE APPARATUS.

CHAPTER I.

SIMPLE STOMATITIS; ULCEROUS STOMATITIS; FOLLICULAR STOMATITIS.

Diseases of the digestive system in infancy and childhood are of frequent occurrence. They are for the most part readily recognized, and are more easily and quickly controlled by therapeutic agents, if rightly applied, than are the diseases of any other system. If misunderstood and improperly treated, they may, even when mild and very manageable in their commencement, become chronic and obstinate, or even fatal, or they may lead to other and more dangerous diseases. It is necessary, then, that the physician should understand thoroughly the pathology as well as therapeutics of the digestive system, that he may make timely and correct use of the required remedies.

The diseases of the buccal cavity in early life are for the most part inflammatory. The mildest is that known as

Simple or Erythematic Stomatitis.

This form of inflammation occurs usually before the completion of first dentition, and it is most frequent under the age of one year. Giving rise in itself to no severe symptoms, and often being connected with other grave and dangerous affections, it is, doubtless, in many cases overlooked. It is sometimes confined to a portion of the buccal surface, or is more intense in one part than in another. In other cases the stomatitis is uniform, or nearly so, affecting the entire cavity of the mouth.

Causes.—The common cause of simple stomatitis in infants is the same as that of most cases of gastro-intestinal inflammation at that age. This is the use of indigestible and therefore irritating food, uncleanliness, personal and domiciliary; in fine, all those agencies which impair the general health, and enfeeble the digestive organs. Therefore, stomatitis, like entero-colitis, is more common in the city than in the country, and among the city poor than those in the better walks of life. Infants deprived of the mother's milk and given a diet which, with all care of preparation, is a poor substitute for the natural aliment, are very liable to this disease. Beaumont ascertained from his experiments on St. Martin that irritative changes produced in the stomach by indigestible substances were soon followed by similar changes in the buccal mucous membrane. Since in young infants any kind of artificial food is less digestible than the breast milk, it is evident why those who are prematurely weaned or are carelessly fed are so liable to stomatitis. This inflammation is also sometimes due to irritating substances taken in the mouth, as drinks habitually too hot or too cold. Stomatitis is also present in measles and scarlet fever. It then corresponds with the cutaneous eruption, and disappears when that subsides.

Another cause is dentition. The gum over the advancing tooth first becomes inflamed, and, other causes perhaps conspiring, the inflammation extends over more or less of the buccal surface. When due to dentition the stomatitis is more apt to be partial than when it arises from a constitutional cause. Mercury, in whatever form introduced into the system, excreted from the salivary glands, and flowing over the buccal surface, is an occasional though now-a-days rare cause.

SYMPTOMS, APPEARANCES.—Stomatitis, like other mucous inflammations, is characterized by increased redness and more or less thickening of the inflamed buccal membrane, by rapid proliferation and exfoliation of epithelial cells, and by an increased functional activity of the muciparous follicles. The heat of the mouth is sometimes augmented in an appreciable degree. The gums in severe cases are swollen and spongy, and bleed easily if rubbed or pressed. The tongue is usually covered with a light fur, and the salivary secretion is augmented to such an extent sometimes as to dribble from the corners of the mouth. Often there is little suffering, but in other cases the child is fretful, experiences pain from the contact of solid food, and if nursing may even wean itself, from dread of pressure of the nipple.

Simple stomatitis is not difficult of detection, provided attention is directed to the mouth. Inspection informs us of its presence and extent. A favorable termination may be confidently predicted, unless there is a state of marked cachexia, or a grave coexisting disease. If circumstances are unfavorable, simple stomatitis may terminate in a more severe form, as the ulcerous or diphtheritic.

TREATMENT.—The physician should endeavor to ascertain the cause, and, if possible, should remove it by appropriate medicinal or hygienic measures. Sometimes no special treatment is required, as in measles or scarlet fever. When the primary affection terminates, the stomatitis disappears of itself. If dentition is the cause, and there is much fever and fretfulness, it may be advisable to scarify over the advancing tooth, and employ such soothing and derivative measures as are required in painful dentition. In these cases mucilaginous and mild astringent lotions may be employed. Borax is a good remedy used either with honey or water; one part of borax to three of honey, or a drachm of borax to an ounce of water. A weak solution of alum is also a good topical remedy. With either of these remedies in a favorable condition of system, and without any serious coexisting disease, the stomatitis is relieved.

Ulcerous Stomatitis.

In ulcerous, or, as designated by Rilliet and Barthez, ulceromembranous, stomatitis, the anatomical characters are those of severe simple stomatitis, with the additional element which gives it the name by which it is designated.

The inflammation usually begins upon the gums and extends along the buccal surface. Wherever it commences, there soon appear little white points underneath the mucous membrane, producing slight prominence of it. These points, which are inflammatory exudations mainly fibrinous, gradually enlarge. Some unite and give rise to large irregular ulcerations; others remain isolated, producing ulcers which are smaller and of more regular shape. There is, indeed, no uniformity as regards the size and form of the ulcers. In the folds of the buccal membrane they are apt to be elongated, while inside the lips, or where the surface is smooth, the circular or oval form predominates.

Ulcerous stomatitis is usually confined to that part of the buccal surface which covers the gums, or is in their immediate vicinity, but in some instances it affects nearly every part of the cavity of the mouth.

If the disease is severe, there is considerable swelling around the ulcers, but the swollen part is soft and cushiony, and not very tender on pressure. The soft and yielding nature of the swelling serves as a means of diagnosis between this disease and the premonitory stage of gangrene, since in the latter affection the swollen part is more indurated.

If the disease grows worse, more ulcers appear; the fibrinous exudation if detached is renewed or it becomes thicker by the formation of new layers. The ulcers grow deeper and wider, and their edges more vascular.

If, on the other hand, there is improvement, the swelling subsides, the ulcers become more clean, their bases approach the level of the mucous membrane and present a granulating appearance. Finally the mucous membrane is reproduced. A considerable time after the ulcers are healed, the new membrane which occupies their site has a redder hue than the adjacent surface.

CAUSES.—Ulcerous, like simple, stomatitis, is most frequent in the families of the poor. Personal uncleanliness, poor food, a residence in apartments dirty, humid, or in other respects insalubrious, favor its development. In fine, a cachectic condition, however produced, is a common predisposing cause. It frequently occurs when the system is reduced or enfeebled by acute diseases, as after the essential fevers and thoracic and intestinal inflammations. In protracted entero-colitis of infants, it is sometimes severe and obstinate, and a case in which this complication arises usually ends unfavorably.

Occasionally several cases occur together or consecutively in the wards of a hospital, and this has led some observers to believe that ulcerous stomatitis is contagious. But its prevalence under such circumstances is attributable to the fact that there is a common exposure to the influences which give rise to the disease, just as a whole household exposed to malaria may be seized with intermittent fever. Difficult dentition is also an occasional cause.

SYMPTOMS.—The symptoms in ulcerous stomatitis are more severe than in the simple form. There is more fever, more salivation, and more fretfulness. The ulcerated surface is sometimes very tender, so that there is but little sleep. Drinks, unless bland and lukewarm, are painful, and, if the ulcers are on the lips or the front of the mouth, the infant nurses less eagerly than usual, and even with reluctance, sometimes weaning itself. Occasionally the submaxillary glands are tumefied, hard, and tender. The breath has an offensive odor. In mild cases in which the stomatitis is of limited extent, this odor may scarcely be noticed, but in severe cases it is almost like that exhaled from putrid substances.

PROGNOSIS.—A favorable prognosis may be given unless the patient is in a decidedly cachectic condition, or there is a serious coexisting disease, under which circumstances the case may be protracted. If death occur, it is due to the cachexia or to some pathological state quite distinct from the stomatitis, most frequently entero-colitis. Ulcerous stomatitis, when the ulcers are small and the inflammation of limited extent, is of course more easily cured than when it is extensive and the ulcers are large.

This disease is very liable to return, unless the general health is good.

TREATMENT.—The physician should endeavor to ascertain the cause of the stomatitis, and so far as possible should remove the patient from its influence. It is often necessary, in order to insure a speedy recovery, to recommend a change in regimen, especially as regards diet and cleanliness. If the patient live in damp, dark, and dirty apartments, the family should seek a better residence, and he should be taken daily in the open air.

Tonic remedies are generally required. The ferruginous preparations may be advantageously given, or the vegetable tonics, or the two in combination. In selecting the internal remedies we must regard the antecedent disease, if there be any, which the buccal inflammation complicates, and on which it depends. For that large proportion of cases in which there is chronic intestinal inflammation, the liquor ferri nitratis with tincture of columbo administered in simple syrup will be found useful. For local treatment Trousseau recommends occasional applications of nitrate of silver or muriatic acid as a caustic, and in the intervals a wash of equal parts of borax and honey.

The chloride of lime is also considerably used in Paris. It is recommended by Rilliet and Barthez. It is applied dry to the ulcerated surface twice daily, and in the interval the mouth is washed with simple water. This treatment is continued till the ulcers present a healthy appearance and begin to cicatrize. Then a weak solution of chloride of lime is employed, one grain to forty-five of the vehicle. By this treatment a cure is usually effected. Bouchut prefers using chloride of lime with honey, one drachm to the ounce.

But painful applications are not required. The remedy which is most employed in this country and in Great Britain is chlorate of potash. It often acts like a specific for this as well as other forms of stomatitis. It may be given dissolved in water with sugar, or with one of the syrups to render it more palatable. The dose is from two to five grains every two hours. It should be allowed to run over the affected part, as it is believed to have a local action.

℞. Potass. Chlorat. ʒj ;
Mellis ℥ss ;
Aquæ ℥ij.
One teaspoonful every two or three hours.

Of all topical remedies in common use, chlorate of potash is the most safe, most easily administered, least painful, and probably the most efficacious. Some physicians prefer the chlorate of soda, on account of its greater solubility.

Follicular Stomatitis.

In this form of stomatitis the inflammation is confined to the muciparous follicles of the mouth, or to them and the mucous membrane in their immediate neighborhood.

ANATOMICAL CHARACTERS.—At first there appear in the mouth minute papular elevations, red, hard, and tender, which continue to enlarge and soon become vesicular. They may now break, leaving an ulcerated surface; but if they continue entire they become purulent, and then their contents are discharged. From the commencement of the papule to the purulent transformation the period is perhaps three or four days.

The ulcer which occupies the site of the eruption is round, hard, painful, and with a vascular margin. The base has a white or grayish appearance. The reparative process soon commences, the ulcer presents a healthy appearance, its size is gradually diminished, and finally cicatrization occurs.

The liquid with which the follicles are distended in the first stages of the disease is believed to be the natural secretion somewhat modified by the inflammation.

The number of ulcers is various. There are in most cases from six or eight to as many as twenty. They are ordinarily discrete, and one or two lines in diameter. The stages of the disease rapidly succeed each other, and the patient fully recovers in from six to eight days, but not always. In exceptional instances the ulcers enlarge and become confluent, or one or more of them assume a gangrenous appearance. This indicates a faulty condition of the system, a vitiated state of the blood, due perhaps to some antecedent or concomitant disease. In these cases the ulcerative stage is apt to be protracted, and recovery doubtful.

The seat of follicular stomatitis is usually the internal surface of the lips and cheeks, the gums, tongue, and occasionally the roof of the mouth. It rarely affects the fauces. Occasionally this form of stomatitis is associated with more general inflammation of the buccal cavity. The gums may then be swollen and tender, bleeding if rubbed or pressed.

CAUSES.—The causes are not fully ascertained. Follicular stomatitis has not usually in my practice occurred in so feeble a state of system as has been present in ulcerous stomatitis. Billard, speaking of the aphthæ, or ulcers of this disease, says: "They are particularly to be seen in children who are very feeble, pale, and of a lymphatic temperament. We do not look for the causes of aphthæ in the retention of the meconium, acidity of the milk, or in the predominance of acidity in the fluids of the child; we attach more importance to the consideration of the original predominance of the lymphatic system, or rather to the remarkable predominance which this system acquires under the influence of bad nutrition and vitiated air which is respired in badly ventilated places in those who are crowded together with a number of sick children."

Barrier considers follicular stomatitis to be allied to those gastro-intestinal diseases which are attended by turgescence of the mucous follicles, and he mentions among the causes habitual congestion of the buccal mucous membrane, and difficult dentition. In most cases probably the exciting cause is some derangement of the digestive organs which may not be appreciable.

While simple stomatitis, and stomatitis with thrush, are most common under the age of six months, follicular stomatitis is rare at this age. It is most frequent during the time which corresponds with dentition, when there is also the most rapid development and greatest activity of the muciparous follicles.

SYMPTOMS.—The constitutional symptoms in a large proportion of cases of aphthæ are slight. In twelve children affected with this disease Billard found the pulse from sixty to eighty beats per minute.

The ulcers are painful, as is indicated by the cries of the child when they are pressed, and its fretfulness. Solid food, and even drinks unless bland and unirritating, are badly tolerated. The salivary secretion is also augmented.

In those rare cases in which the ulcer becomes confluent or gangrenous, the state of the patient is really serious. There is then often gastro-intestinal disease. The symptoms indicate prostration. The pulse is feeble, the countenance pallid, and the body and limbs become wasted.

DIAGNOSIS.—This is easy. The only disease with which it is liable to be confounded is ulcerous stomatitis. In the ulcerous form there is antecedent and accompanying stomatitis affecting a considerable part, if not the entire buccal cavity, while in the follicular form the inflammation is ordinarily confined to the immediate vicinity of the ulcers. The character of the ulcers serves also as a means of distinction. In ulcerous stomatitis there is great variety as to size and form, while in follicular stomatitis there is great uniformity in both these respects. The small, circular ulcers are characteristic of the follicular inflammation. Before the ulcerative stage the vesicular eruption serves to distinguish this form of stomatitis from other local diseases affecting the cavity of the mouth.

PROGNOSIS.—Follicular stomatitis usually ends favorably; but, if the ulcers become concrete or gangrenous, the health is seriously affected, and a more cautious prognosis should be expressed. The unhealthy appearance of the mouth, and the real danger, are often more due to the depressing effect of some concomitant disease than to the stomatitis.

TREATMENT.—In ordinary follicular stomatitis, which is discrete and attended by little or no constitutional disturbance, local remedies suffice to cure the disease. Demulcent drinks, or applications to the mouth, should be used, as the mucilage from gum acacia, marsh-mallow, or flaxseed. Mild astringent lotions with the demulcent are also beneficial. The mel boracis is one of the best and most agreeable applications. It may be placed in the mouth with a spoon, or applied with a camel-hair pencil. If there is much tenderness of the ulcers, with restlessness, a small quantity of some opiate should be added to the lotion, or it may be administered separately.

With this simple treatment the ulcers generally soon heal, and the health of the patient is restored. If, however, the ulcers are quite painful, and not disposed to heal, or are healing tardily, they may be touched lightly with a pencil of nitrate of silver, or, as Barrier recommends, hydrochloric acid in honey of roses. This diminishes the tenderness and expedites the healing process.

If, as may in rare cases occur, the ulcerations are numerous, and are accompanied by considerable fever, there may be symptoms indicative of cerebral congestion, or even premonitory of convulsions. In such cases laxative and diaphoretic remedies are required, and sinapisms or other revulsive applications to the extremities.

If there is an unhealthy appearance of the ulcers, if they gradually enlarge, or become concrete, or gangrenous, indicating a cachectic state, tonics should be employed with nutritious and easily digested diet, and anti-hygienic influences should so far as possible be removed.

CHAPTER II.

THRUSH.

The terms thrush, sprue, and muguet, the last from the French, are synonymous. They are used to designate a particular form of inflammation of the digestive apparatus, the peculiar feature of which is the presence of points or patches of a curd-like appearance on the inflamed surface.

The usual seat of thrush is the mucous membrane of the mouth, but occasionally it affects the fauces, pharynx, and œsophagus. It is very rare in the sub-diaphragmatic portion of the digestive tube, but a few such cases have been reported by Billard and others. It never affects the membrane of the nostrils, larynx, or bronchial tubes, and it very seldom occurs in any other part of the alimentary canal without also being present in the mouth. Thrush, then, is a stomatitis, pharyngitis, or œsophagitis, or a gastro-enteritis, with the additional element which I have described.

Anatomical Characters.—The first stage of thrush is that of simple inflammation of the mucous surface. There next appear minute semi-transparent points or granules, which, increasing, soon become white and opaque. Some of them remain as points, while others, extending, and perhaps coalescing with those adjoining, form patches of greater or less extent. The white points or patches are unequally elevated. Their central part, which was first formed, is most raised, while their circumference projects but little above the epithelium. Their highest elevation is not ordinarily more than a line above the surface. They are smaller in the pharynx and œsophagus than when occurring upon the buccal surface. They resemble closely, in color and consistence, portions of curdled milk, and the nurse often mistakes them for such, and neglects to call attention to the state of the mouth. They are readily detached by a little force, but are speedily reproduced. Their color in the first days of the complaint is white, and sometimes this color continues. In other cases they assume, if the disease is protracted, a yellow hue.

Their true nature, long unknown, was finally revealed by microscopy. They consist in part of epithelial cells, and in part of a vegetable growth. This parasitic plant is in most cases the oidium albicans. Like other confervæ, it consists of roots, branches, and sporules. The roots are transparent, and they penetrate the epithelial layer, sometimes even to the basement membrane. The branches divide and subdivide at an acute angle, and under the microscope they are seen to consist of elongated cells, with one or two nuclei. Around these branches are numerous sporules. In two or three instances I have examined the product of thrush removed from the œsophagus, and in both the parasitic plant was the penicillium glaucum, or a conferva closely resembling it.

In the mildest form of thrush, this morbid product is in points or small patches. If the patches are of large extent, especially if, as rarely happens, a considerable part of the buccal surface is covered by them, there is generally a state of great prostration and danger, from some antecedent or concomitant disease. Thrush is, indeed, often the sequel of some grave affection, as pneumonitis or gastro-intestinal inflammation. Its complication with the last named disease is common in young, ill-fed infants, especially those deprived of the breast milk, and such cases are very apt to be fatal.

Hence, some writers, who have studied infantile diseases in foundling hospitals, regard thrush as one of the most serious affections of early life. Valleix, in a book of seven hundred pages relating to diseases of children, devotes more than one-third to the consideration of muguet. Of twenty-four cases, the records of which he publishes, twenty-two died, but their death was due to gastro-intestinal inflammation, which the author considered a part of the more general disease, muguet. Doubtless the same cause which produced the stomatitis, with the confervoid growth, in these infants, also produced the fatal gastritis or gastro-enteritis, occurring without this growth upon the gastric or intestinal surface. It seems to me much better to restrict the term sprue, thrush, or muguet to the inflammation of that portion of the mucous surface which is the seat of the parasitic growth. I reject, then, from my description of the anatomical characters of thrush, those subdiaphragmatic inflammations which some writers consider an important part of this disease, and place them in the list of coexisting affections. When the fatal gastric or intestinal inflammation is accompanied by the characteristic vegetable growth on the gastric or intestinal surface, it is proper in my opinion then, and only then, to say that death occurred from thrush. This explanation seems necessary in order to understand the different statements of writers in relation, not only to the anatomical characters of thrush, but also in reference to its mortality.

The frequent coexistence of thrush with gastro-intestinal inflammation, has been remarked in the hospitals of Europe, and in the Infant Asylum and the Child's Hospital, in this city. In the post-mortem examinations of those who have died in these last institutions, having thrush at the time of death or immediately prior to it, and who for the most part have been infants under the age of three months, I have frequently found evidences of inflammation in every division of the alimentary canal. The confervoid growth was, however, seldom found below the fauces, and never below the œsophagus.

SYMPTOMS.—The symptoms in thrush are not different in most cases from those of simple inflammation. In the mildest cases they are chiefly of a local nature, such as have already been described in our remarks on simple stomatitis. If the inflammation is more extensive, especially if it affect the fauces and œsophagus, the infant becomes feverish and fretful, and the inflamed surface is hot, red, and tender. In the worst forms of thrush this surface not only presents the ordinary features of severe inflammation, namely heat, redness, and tenderness, but it is sometimes deficient in the natural secretion, so as to present a dry or parched appearance. It is in these cases that there is often a more extensive inflammation than that of the buccal or œsophageal membrane. The sub-diaphragmatic portion of the digestive tube is inflamed. The infant in these severe cases has thirst, loss of appetite, restlessness, vomiting, and frequently diarrhœa. The countenance is anxious and pale; there is rapid emaciation, and, if the disease is not arrested, a state of extreme prostration soon occurs. The twenty-four severe cases related by Valleix, already alluded to, twenty-two of which were fatal, were examples of this severe form.

CAUSES.—Thrush is most apt to occur in those who are constitutionally feeble, or who are enfeebled by disease, or by unfavorable hygienic conditions. Cachexia is a cause common to thrush and most other subacute inflammations of the alimentary canal. The most obvious and common of the unfavorable hygienic conditions alluded to is the continued use of indigestible and improper food. It is, therefore, a common disease among foundlings, in institutions where these unfortunates are received, since they not only breathe an atmosphere which is often impure, but are deprived of the mother's milk, and are so frequently given a diet which is a poor substitute for it. Among the poor of the cities thrush is common, since with them, from necessity or choice, there is the greatest neglect of sanitary requirements. Exposure to humidity, to variations in temperature, increases the liability to the disease, though in less degree than defective alimentation. Billard and Valleix agree that thrush is more frequent in the warm months than in the cold, that its maximum frequency is in the months of July, August, and September. Cases in the Infant Asylum and Child's Hospital, of this city, have appeared to me to correspond in this respect with those related by Billard and Valleix. Various writers have mentioned the age at which thrush is most apt to occur, as one of the predisposing causes. Thrush is not common above the age of six months, and a majority of the cases occur under the age of three months. Infants of the age of one or two weeks, if in addition to lactation they are spoon-fed by nurses over-anxious that they should thrive, are apt to take the disease.

Diagnosis.—This is easy so far as thrush in the mouth is concerned, for simple inspection by one familiar with the disease is all that is required in order to discover it. The presence of thrush in portions of the alimentary canal hidden from view cannot be positively ascertained.

The vomiting, diarrhœa, pain or fretfulness, emaciation, and rapid sinking, which sometimes accompany severe forms of thrush, indicate gastro-intestinal inflammation, to which the attention of the practitioner should be chiefly directed.

Prognosis.—The duration of thrush varies according to its intensity, and the favorable or unfavorable condition of the child. If it is slight and the health of the infant otherwise good, it may often be cured in two or three days. Under other circumstances it may continue as many weeks or even longer, before it is entirely removed.

When thrush occurs in connection with gastro-enteritis, the mortality is very great. It has been already stated that in Valleix's twenty-four cases twenty-two were fatal. M. Auvity estimates the mortality of such cases at nine in ten, and M. Godinat at two in three.

Treatment.—As one of the most common causes of thrush is the use of indigestible or improper food, the physician should ascertain the nature of the infant's diet, and if it is faulty should direct a better. In many cases the infant is bottle-fed. It should be given only the mother's milk if practicable, or that of a healthy wet-nurse. This change of alimentation often removes the sole cause of thrush in the young infant, so that it rapidly recovers.

If artificial feeding is necessary, such diet should be advised as is directed in our remarks on the treatment of the diarrhœal maladies. There is often in thrush an excess of acidity in the digestive tube, and an alkali is required. Trousseau recommends the addition of saccharate of lime to the milk. Children with this disease should also be taken from filthy and damp apartments, to those in which the air is pure and dry.

The remedy in common use in the treatment of thrush, and which is usually effectual, is borax. This, if applied sufficiently often to the affected membrane, not only destroys the parasitic growth, but prevents its reproduction. It is commonly employed with honey, or in a powder with sugar or dissolved in water. The officinal mel boracis, consisting of one part of borax to eight of honey, is so much used in families that it may be considered almost a domestic remedy. There is, however, an objection to using any application for the removal of thrush which contains either sugar or honey, since either substance remaining in the mouth would rather promote the growth of the parasite. Still, it is desirable to employ a wash of such consistence that it will remain a longer time in contact with the buccal surface than will a simple solution in water. I know no better vehicle for the borax than glycerine, which has the advantage of consistence, does not readily undergo any chemical change, and has no unpleasant flavor. The borax may be used dissolved in glycerine, with or without some flavoring ingredient:—

℞. Sodæ borat. ʒj;
Glycerinæ ℥ij;
Aquæ ʒvj. Misce.

Borax should be used four or five times daily, and continued for a time after the disease has disappeared from sight, since the roots of the plant must be destroyed or the branches are rapidly reproduced. It should be applied by a camel-hair pencil, or with a soft cloth upon the finger or a stick. It should be so freely used, in extensive and severe forms of the disease, that the infant will swallow some, as the entire œsophagus is apt to be affected in such cases. In the intervals between the applications of borax, if the buccal surface is hot, dry, and tender, so as to increase the fretfulness of the infant, it is well to use mucilaginous washes, as the mucilage of acacia or mallows. If the disease continue notwithstanding the use of these measures, the mouth should be occasionally washed with a weak solution of nitrate of silver or sulphate of zinc:—

℞. Zinci sulph. gr. ii–iv;
Aq. Rosæ ℥ij. Misce.

In many cases, however, the treatment of thrush is of less importance than that of the disease which the thrush complicates. The remedial measures which I have mentioned then become subordinate to those employed for the graver disease. When this disease is relieved and the general health improves, thrush is more easily and permanently cured than during the state of feebleness and ill-health.

CHAPTER III.

GANGRENE OF THE MOUTH.

THE diseases of the mouth which we have been considering are attended by little danger, but the one which we are next to consider is among the most fatal affections of early life. It is gangrene of a portion of the cheek or gums, or of both. It is described by writers under various names, as cancrum oris, noma, necrosis infantilis, aqueous cancer of infants.

ANATOMICAL CHARACTERS.—Gangrene of the mouth is sometimes preceded by ulceration of the mucous membrane, at the point where it is about to commence, but in other cases this membrane is entire. The tissues at the point of attack, which is most frequently the inside of the cheek, become inflamed, thickened, and indurated. The induration extends, and soon the purple hue of gangrene appears and increases. The next stage in the progress of gangrene is sloughing of the portion the vitality of which is lost.

The slough does not present the appearance of uniform decay. While the color is generally dark, there are in the mass fibres of connective tissue or even bloodvessels, which remain unchanged or are but partially decomposed. After separation or sloughing of the part where the vitality is first lost, the surface of the excavation, if the disease is not checked, has a dark, jagged, and unhealthy appearance. Commencing with the mucous membrane and the tissue immediately underlying it, the disease extends on the one side towards the skin, and on the other towards the deeper seated structures of the jaw. According to Billard, the swelling which precedes and surrounds the gangrene is in great part œdematous.

This disease is occasionally primary, but in a large proportion of cases it is secondary. Occurring secondarily, its symptoms are often masked by those of the antecedent and coexisting affection. Under such circumstances attention is sometimes first directed to the mouth, by the loosening of one or more of the teeth, or the appearance on the skin of a livid circular spot, which indicates the approach of the disease to the cutaneous surface. The mucous membrane presents a dark red appearance to the distance of a few lines beyond the point of gangrene. It covers tissues which are inflamed and indurated and about to become gangrenous.

The tongue is usually more or less swollen, unless the disease is mild; an offensive odor arises from the gangrene, due to the evolution of sulphuretted hydrogen and other gases. There is great difference in the extent of the destruction, and the gravity of the disease, in different cases. It may sometimes be arrested by proper applications and a favorable change in the general health of the child at an early period, when there is little loss of substance. In other cases it extends till it perforates the cheek, or even destroys a considerable part of the side of the face, and, extending inwards, attacks the periosteum of the maxillary bone, destroying the gum and teeth, and denuding the alveoli. Recovery, if it take place at all under such circumstances, is with the loss of a portion of the bone, and with deformity.

The duct of Steno is sometimes included in the gangrenous portion, but it commonly resists the destructive process, and remains pervious.

AGE.—The age at which gangrene of the mouth occurs is usually between two and six years. In twenty-nine cases collated by Rilliet and Barthez, twenty-one were between the ages of two and six years, and the remaining eight were from six to twelve years old. Of the cases which have fallen under my observation, all were between the ages of two and six years. It is seen that the period of greatest frequency of gangrene of the mouth is different from that at which the ordinary forms of stomatitis occur.

Gangrene of the mouth may, however, occur under the age of one year. Billard reported three cases under the age of one month, but in two of these the disease does not appear to have been sufficiently marked to render it certain that they were genuine cases of this affection.

CAUSES.—Gangrene of the mouth usually occurs in those whose systems are reduced or cachectic. It is, therefore, more frequent among the poor than those in comfortable circumstances; in the city than in the country. It is more frequently observed in asylums for children than in private practice. Half the cases which I have seen have been in these institutions. If the constitution is naturally good, it can only occur in those long deprived of pure air and wholesome nutriment, or those enfeebled by disease.

Among the diseases which have been known to terminate in or be followed by gangrene of the mouth, are the pulmonary and intestinal inflammations, hooping-cough, and the fevers, both eruptive and the non-eruptive. Rilliet and Barthez have published a table of ninety-eight cases in which gangrene resulted from other diseases. In forty-one of these the antecedent disease was measles, in five scarlet fever, six hooping-cough, nine intermittent fever, nine typhoid fever, seven mercurial salivation, and five enteritis. It is seen that the essential fevers were the most frequent cause of the gangrene. Of forty-six cases collected by MM. Bouley and Caillault, the antecedent disease was measles in all but five. In this city, also, a larger number occur from measles than from any other disease.

One reason why so many cases of gangrene occur as a sequel of measles is probably because this disease is accompanied by stomatitis. Simple or ulcerous stomatitis often precedes gangrene.

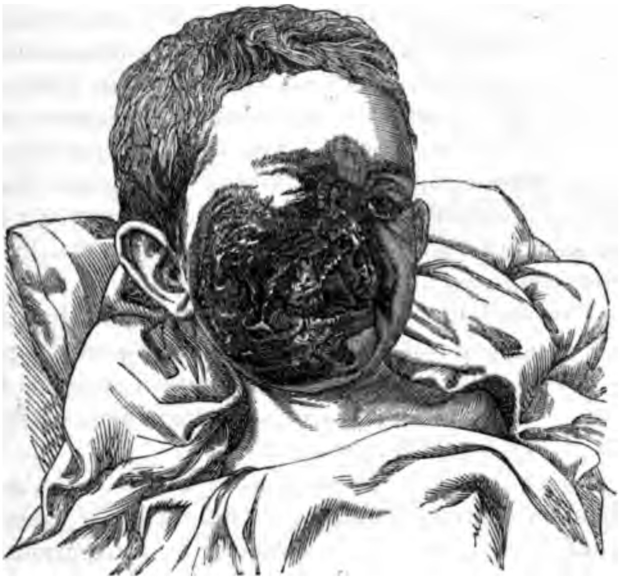
Diseases sometimes terminate in gangrene of the mouth chiefly in consequence of injudicious treatment, which has lowered the vitality of the system. Rilliet and Barthez mention the case of a child four years old, in whom gangrene commenced at the twenty-ninth day of primitive pneumonia. This child had been reduced by the application of twelve leeches, three scarifications, a large blister, and by the use of absolute diet.

The misuse of mercury was once a much more frequent cause of gangrene than at present, at least in this country, since this agent was formerly much more employed than now. In fact most of the affections of infancy and childhood in which mercurials were formerly employed are now treated without it.

SYMPTOMS.—Gangrene of the mouth so often occurs in connection with other disease, that its symptoms are in a large proportion of cases blended with those which arise from a distinct pathological state.

There is usually prostration more and more pronounced as the gangrene extends. The features are ordinarily pallid, but occasionally their normal color is preserved for a time; the expression of the face is melancholy but composed. Sometimes the child is fretful, if disturbed; at other times it will quietly consent to an examination. The suffering is not proportionate to the gravity of the disease. There is less pain often than in some of the forms of stomatitis which are unattended with danger.

As the disease advances, the body and limbs gradually waste, the eyes are hollow, or, if the gangrene is near the orbit, the eyelids become œdematous, the lips are infiltrated, and both the lips and nostrils are often incrusted. If the cheek is perforated, alimentation is rendered more difficult, and the appearance of the child is melancholy in the extreme.



The tongue is usually moist; it is occasionally swollen. The saliva flows from the mouth, either pure or mixed with offensive sanguinolent matter. Unless the disease is slight, there is the peculiar gangrenous odor. The appetite is sometimes poor, at other times it is preserved through the whole sickness. There is no vomiting or looseness of the bowels, unless from a complication.

The thirst is usually great, and the pulse is accelerated and feeble, except in mild cases.

The skin in the commencement of gangrene is hot. When the vital force is much reduced, and especially as the disease approaches a fatal termination, the face and limbs become cool, and the surface generally presents a waxen or ashy appearance. There is no derangement of the respiratory system. Those cases which are attended by a cough or accelerated respiration are really cases of bronchitis or pneumonitis, coexisting with the gangrene.

Diagnosis.—Gangrene of the mouth is easily diagnosticated. In those cases in which ulceration precedes the gangrene, it might be mistaken in its first stages for that form of ulcerous stomatitis in which the ulcers assume an unhealthy appearance. The following are the distinguishing features of the two affections: Around the ulcer where gangrene is about to commence, the tissues are greatly thickened and indurated, or œdematous, while ulcerous stomatitis begins with a submucous deposit of fibrin, and is attended by little thickening of the surrounding parts, and little or no induration or œdema. In ulcerous stomatitis, the skin over the seat of the disease presents its normal appearance, whereas in gangrene it presents a distended and shining appearance. The destructive process in ulcerous stomatitis is also more limited than in gangrene. Deep ulcerations do not occur, or are rare. Ulcerous stomatitis is more readily healed, and it leaves no eschar, contraction, or deformity.

The differential diagnosis of gangrene of the mouth, from those cases of follicular stomatitis in which the ulcers occupying the seat of the follicles assume a gangrenous appearance, must be made by a consideration of the same facts or particulars which serve to distinguish it from ulcerous stomatitis.

Malignant pustule, of rare occurrence in the child, resembles this disease in some of its features. But the pustule always begins on the skin, while gangrene is a disease of the mucous surface primarily. In gangrene, therefore, the chief destruction is of the mucous membrane and of the submucous tissue, while in malignant pustule the chief destruction is of the skin and the subcutaneous tissue.

Prognosis.—This depends, not only on the extent of the gangrene, but the nature of the disease, if there be one, which gave rise to it, and the degree of cachexia. If it occurs in connection with or as a sequel of one of the least debilitating diseases, and there is considerable vigor of system, it may often be arrested when it has destroyed only the mucous and subcutaneous tissues, so that no deformity results. The friends may congratulate themselves if the case terminate so favorably. In the graver cases, when the gangrene extends till it destroys the periosteum of the maxillary bone on the affected side, and perhaps perforates the cheek, if the child recovers it is with the permanent loss of teeth, tedious separation of the necrosed bone, and a cicatrix, which is apt to interfere with the free use of the jaw. Death is, however, the more common termination of severe cases. Occasionally the gangrene destroys the continuity of a bloodvessel, causing abundant hemorrhage, and accelerating the fatal result. In most cases, however, there is little or no hemorrhage, in consequence of coagulation in the vessels.

Another serious complication occasionally arises, namely, gangrene of other parts, as of the external genital organs. The English editor of Bouchut's treatise on diseases of children, relates the following interesting case, from the *Transactions of the Edin. Medico-Chir. Society*:—

An infant eight months old became affected with gangrene of the face, head, and hands. "The right ear and the entire hairy scalp were of an intensely black color, and on both cheeks patches existed about the size of a half-crown piece. The right thumb and the backs of both hands were similarly affected. The child was noted to have been restless and feverish on May 22d, and on the 23d a slightly darkened ring was found to have formed round the thumb, about the middle of the first phalanx; in a few hours the whole thumb was gangrenous, and the dorsum of the hand became involved. On the ear the gangrene commenced with the appearance of a fleabite, and subsequently extended rapidly to the scalp, assuming a remarkably regular form, and giving to the child the appearance of wearing a black skullcap. The pulse was observed to be very feeble. * * * Death took place in twelve hours from the first appearance of gangrene on the thumb, the child being sensible and continuing to suck well, up to a few minutes before death."

Rilliet and Barthez state that pneumonitis is apt to arise in the course of gangrene of the mouth. Such a complication evidently diminishes materially the chance of recovery.

Whether the result be favorable or unfavorable, it is evident, from the nature of the disease, that the duration is very different in different cases. The physician's attendance may be required for a week or two or for several weeks.

TREATMENT.—As gangrene of the mouth is eminently a disease of debility, all anti-hygienic influences should be removed, and the most nourishing diet, together with tonics, be recommended. The ferruginous preparations or the bitter vegetables are required.

As soon as the physician is called, he should endeavor to arrest the gangrene, accelerate the detachment of the slough, and produce a healthy and granulating state of the surrounding tissues. This is best effected by applying a highly stimulating or even escharotic agent to the inflamed surface underneath and around the gangrene. For this purpose a great variety of substances have been used by different physicians, such as acetic, sulphuric, nitric, and hydrochloric acids, nitrate of silver, the acid nitrate of mercury, chloride of antimony, and even the actual cautery.

M. Taupin recommends, after removing a considerable part of the gangrenous substance with scissors or some instrument, the application of strong muriatic acid, and, when the slough is detached, of dry chloride of lime.

Rilliet and Barthez advised the use twice daily of muriatic acid or the acid nitrate of mercury, applied by a brush upon and around the slough, followed immediately by the application of dry chloride of lime, when the mouth is to be thoroughly washed with water from a syringe. They direct in the interval frequent ablution with water. After the slough has separated, the escharotic is to be discontinued, and the chloride of lime used alone. If gangrene extends to the skin, a crucial incision is to be made and the escharotic applied, after which powdered cinchona is introduced and retained by a plaster. This treatment is to be continued till the gangrene is arrested and the decayed portion removed. Barrier, Valleix, and most French writers, recommend essentially the same treatment, namely, the application of undiluted escharotic agents.

A safer, less painful, and, in my opinion, preferable, treatment, is that employed by many British and American physicians, namely, the use of escharotic agents diluted, or, if applied in their full strength, such as are least active and penetrating. Some employ from the first topical treatment which is astringent and stimulating rather than escharotic, and they report satisfactory results.

Dr. Gerhard believes "the best local applications are the nitrate of silver, if the slough be small in extent; if much larger, the best escharotic is the muriated tincture of iron, applied in the undiluted state. After the progress of the disease is arrested, the ulcer will improve rapidly under an astringent stimulant, such as the tincture of myrrh, or the aromatic wine of the French Pharmacopœia."

The local treatment recommended by Evanson and Maunsell I believe to be preferable to that advised by any of the writers from whom I have quoted. I have seen it so successful, that I should employ it in all ordinary cases from the first visit. A knowledge of this treatment will be best imparted by quoting from the authors (*Diseases of Children*, 2d Amer. edit., page 188): "The lotion which we have found by far the most successful is a solution of sulphate of copper as employed by Coates in the Children's Asylum. His formula is as follows:—

"℞. Cupri sulph. ʒij;
Pulv. cinchonæ ℥ss;
Aquæ ℥iv. M.

"This is to be applied twice a day very carefully to the full extent of the ulcerations and excoriations. The addition of the cinchonæ is only useful by retaining the sulphate of copper longer in contact with the edges of the gums. A solution of the sulphate of zinc, ʒj to an ounce of water, by itself or combined with tincture of myrrh, Dr. Coates found to be also useful in some cases."

A moment's reflection will show us that the above treatment is far preferable, provided it is equally effectual in arresting the gangrene, to the treatment by the strong escharotics which some of our best practitioners employ.

Take, for example, the use of pure nitric or muriatic acid, which physicians of experience recommend. This agent causes such pain that it occasions restlessness of the child, and such stout resistance that the use of chloroform has been recommended to facilitate its application. The pain occurring from it and from the inflammation which it excites doubtless reduces the strength which it is very necessary to preserve. If the acid comes in contact with the teeth, as it generally will, it injures them irreparably, and it sometimes attacks the jaw-bone. Dr. West, who advocates the use of the acid (*Diseases of Infancy and Childhood*, 4th Amer. edit., page 467), says: "In one of the cases that I saw recover, the arrest of the disease appeared to be entirely owing to this agent, though the alveolar processes of the left side of the lower jaw from the first molar tooth backwards died and exfoliated, apparently from having been destroyed by the acid." No such result follows the use of the solution of sulphate of copper, and of its efficacy I can speak confidently. In one of those severe cases in which the disease resulted from scarlet fever, and in which there was so much debility that an unfavorable prognosis was made, I succeeded in arresting the disease by the use of Dr. Coates' prescription. The child recovered with the loss of two teeth, and the corresponding portion of the maxillary bone.

The application should be made twice a day till the gangrene is arrested, and healthy granulations appear.

The gases arising from the gangrenous mass are not only highly offensive to others, but they are doubtless injurious to the patient, who is constantly inhaling them. To remove the fetor chlorine or carbolic acid properly diluted should be occasionally used between the applications of the sulphate of copper. Labarraque's solution, one part to eight or ten parts of water, is an eligible form for its use. When the gangrene is removed, and the granulations present a healthy appearance, all danger is usually past, and convalescence is fully established. Then no energetic topical treatment is required. A mild stimulating lotion, like the tincture of myrrh, as recommended by Dr. Gerhard, suffices with the aid of tonics and nutritious diet.

CHAPTER IV.

DENTITION.

The part which dentition bears in the causation of disease is not fully ascertained. We know that the opinion formerly entertained in the profession, and now prevalent in the community, that a large proportion of the affections of infancy arise directly or indirectly from it, is erroneous. Still, many of the best authorities in infantile pathology concur in the belief that difficult and painful evolution of the teeth frequently causes derangement in the functions of organs, even those remote from the mouth, and sometimes produces in them a real pathological state. They, therefore, frequently speak of dentition as a cause of disease. On the other hand, there are physicians equally good observers, and the number is increasing, who almost wholly ignore the pathological results of dentition. They say that, as it is strictly a physiological process, it should, like other such processes, be excluded from the domain of pathology. Experience, they assert, corroborates this opinion, and therefore dentition should seldom, if ever, be interfered with by the lancet or other means.

A moment's reflection will show how important it is to understand the exact relation of dentition to infantile diseases. Every physician is called now and then to cases of serious disease, inflammatory and others, which have been allowed to run on without treatment, in the belief that the symptoms were the result of dentition. I have known acute meningitis, pneumonitis, and entero-colitis, even with medical attendance, to be overlooked during the very time when appropriate treatment was most urgently demanded. Many lives are lost in this manner, especially from neglected entero-colitis, the friends and even physicians believing the diarrhœa to be symptomatic of dentition, a relief to it, and therefore not to be treated. Such mistakes are traceable to the erroneous doctrine, long inculcated in the schools, that dentition is directly or indirectly the cause of a large proportion of infantile diseases and derangements.

May there not be an error in the opposite direction? May not some diseases be rendered milder, and their favorable termination more certain or probable, by measures calculated to relieve the turgescence of the gums? If so, those who totally disregard the state of the gums are not less in error than those who use the gum lancet when it is not required.

I shall endeavor to point out what is really ascertained in regard to the relation of dentition to disease.

First dentition commences at the age of about six months and terminates at the age of two and a half years. The corresponding teeth of the two sides pierce the gum at about the same time. The two inferior central incisors first appear at about the age of six or seven months, followed, in the order in which they are mentioned, by the upper central incisors, upper lateral incisors, lower lateral incisors, the four anterior molars, the four canines, and, lastly, the four posterior molars.

The incisors usually appear in rapid succession, so that all are in sight by the age of one year. From the age of one year to sixteen months the anterior molars penetrate the gum, from the age of sixteen to twenty-four months the canines, and from twenty-four to thirty months the posterior molars.

This order is not always preserved. Sometimes the upper central incisors appear before the lower, and sometimes the lower lateral before the upper lateral. In rare cases there have been teeth at birth. I have seen but one or two infants with such premature dentition. Retarded dentition is much more common. Those who have rickets, or are feeble either constitutionally or by disease, often have no teeth till considerably after the usual period. In such the first incisors may not appear till the age of twelve months, or even later.

Pathological Results of Dentition.—The evolution of the teeth is commonly attended by more or less turgescence around the dental bulbs. This is greater with some of the teeth than with others. Thus, the superior incisors cause more swelling than do their congeners of the inferior jaw. The turgescence, although it may be attended by more or less congestion, is so common that it is hardly proper to call it a disease. Turgescence, with redness and more or less tenderness of the swollen gum, may be considered the simplest pathological state.

In other cases there is an unusual amount of swelling around the dental follicles, the afflux of blood to them is greatly augmented; they are the seat of such a degree of tenderness and pain that the infant is fretful. It carries the finger often to the mouth, indicating the seat of its suffering. The surface over the follicles presents greater redness than in ordinary dentition, and the salivary secretion is considerably increased. There is now actual gengivitis.

Sometimes the inflammation affects a greater extent of the buccal surface than that lying directly over the follicles, so that most writers speak of stomatitis as one of the results of dentition. In a few cases I have known such a degree of inflammation over the advancing tooth, that a small abscess formed, producing much pain and restlessness, till it was opened by the lancet.

The pathological results of dentition which I have mentioned are unimportant in comparison with others not yet alluded to. They do not endanger the life of the child. They are easily detected. They result directly from the rapid growth and augmented sensibility of the dental follicles.

There are other accidents of dentition occurring in distant parts of the system in consequence of that mysterious relation and interdependence of organs which exist through the system of nerves.

These accidents are more serious, and their relation to dentition is obviously less readily ascertained, than are those located in the mouth. The most common of them occur in the stomach and intestines.

Some children, previously to the eruption of the teeth, are affected with diarrhœa, occasionally accompanied by irritability of stomach. Certain writers have supposed that gastro-intestinal inflammation is present in these cases; others that there is simply a hyper-secretion, an increased activity of the intestinal follicular apparatus, that it is, in other words, one of the forms of non-inflammatory diarrhœa. Barrier believes that the diarrhœa of dentition depends usually on what he calls a "subinflammatory turgescence limited to the gastro-intestinal follicular apparatus." He believes that, in occasional cases, it is due to defective or altered innervation. It would then be analogous or similar to that form of diarrhœa which occurs in the adult from the emotions. Bouchut calls the diarrhœa of dentition nervous diarrhœa. It is certain, however, that in most cases of diarrhœa which are attributed to dentition there are other causes, such as unsuitable food, or residence in an insalubrious locality. It is certain, as regards city infants, that the chief causes of diarrhœa during the period of dentition are strictly anti-hygienic, dentition being quite subordinate as a cause, and probably often not operating at all as such. But when, as sometimes happens, at each period of dental evolution, the infant is affected with diarrhœa, the influence of teething is apparent. Such cases enable us to see that teething may really sustain a causative relation to certain diseases not located in the buccal cavity.

Among the most common pathological results of difficult dentition, are certain affections referable to the cerebro-spinal system. Eclampsia is one of the admitted results. Barrier attributes convulsions in the teething infant to excitement of the nervous system arising from the pain which is felt in the gums, and to a determination of blood to the dental apparatus, in which afflux the whole vascular system of the head participates.

In most cases of convulsions occurring during the period of dental evolution, a careful examination discloses other causes in addition to the state of the gums. Difficult dentition must then be considered, not so frequently a direct as a co-operating or predisposing cause, producing a sensitive state of the nervous system, or possibly an afflux of blood to the head, of which Barrier speaks, and which, by an additional stimulus, perhaps trivial in itself, ends in convulsions. In exceptional instances eclampsia occurs mainly from dentition, or, if there are other causes, they are quite subordinate. This may happen when several teeth penetrate the gum at or about the same time. Infants who are burnt or scalded are very liable to clonic convulsions. This is, in fact, the chief danger as regards life from such accidents. So, the swollen and tender gum, if several teeth are about emerging, may affect the cerebro-spinal system like the burn or scald, and produce the same nervous phenomena. Thus, in a case already alluded to in the chapter on convulsions, five incisors pierced the gum within about two weeks, and in this period there were two attacks of eclampsia with an interval of a few days. The attacks were not severe, and the most careful examination could discover no other cause than the simultaneous development of so many dental follicles. Previously, and since, the infant has been well.

Dentition sometimes, though rarely, occasions also tonic convulsions. The following case occurred in the practice of Dr. A. S. Church, of this city, the history of which he has kindly communicated, as follows:—

"H., seven months old, was first visited April 3d, 1863. The patient had been fretful for several days, but about daylight on the morning of my first visit it commenced crying, and had not ceased for a moment at the time of my visit, 9 A.M. The bowels were somewhat constipated and tympanitic; abdominal muscles very tense. The pain was supposed to be in the abdomen, and a brisk cathartic, to be followed by an anodyne, was ordered. Some relief followed, but, on the ensuing and for several consecutive mornings, the pain returned, each day lasting longer, until the child only ceased crying while under the influence of a full anodyne. The gum over the upper incisors was considerably swollen, hot, and dry, but the parents would not consent to have it scarified. For the first week there was no fever, no vomiting, and not the least indication that the nervous system was suffering. About the 10th the thumbs were noticed to be flexed during the attack of pain, and about the 15th the flexors of the toes were contracted and the hands were turned backwards and outwards, but only while the child was awake. About the 20th there was constant contraction of the flexors of both extremities, with opisthotonos, and constant rolling of the head, loss of appetite, progressive emaciation, coated tongue, and highly inflamed gums. Consent was, finally, obtained to relieve the inflamed gum, and free incisions were made, and the following night the child slept comfortably for three hours without opiates. In three days the gums were freely cut again, and the teeth soon made their appearance. All symptoms of disease had now ceased, the child became playful, and on the 30th the patient was discharged."

The opinion has been prevalent in the profession, that painful and difficult dentition is one of the chief causes of infantile paralysis, but it is now commonly admitted that it is only a subordinate or remote cause if indeed it is proper to consider it as a cause at all (see Art. Paralysis).

Some writers express the opinion that acute meningitis occasionally results from teething. The facts, however, that are relied upon to prove this are uncertain. The occurrence of meningitis during dentition is probably in most instances a coincidence.

Teething less frequently disturbs the respiratory system than either the digestive or cerebro-spinal. A cough occurs in some infants at each period of dental evolution. It is attended by little expectoration, but appears to be associated with, in at least certain cases, an inflammatory turgescence of the bronchial mucous membrane.

Acceleration of pulse is often observed at the time of greatest swelling and tenderness of the gum. It subsides with the protrusion of the tooth. The febrile movement of dentition is irregular, sometimes presenting a remittent form, like remittent fever or the fever premonitory of meningitis. Eczema and certain other cutaneous diseases are common during dentition, but their dependence on it as a cause has not been demonstrated.

DIAGNOSIS.—The accidents of dentition which are located in the mouth are easily diagnosticated, except the odontalgia which writers describe, and which is not necessarily attended by any perceptible anatomical alteration of the gums. Those accidents which pertain to remote and concealed organs are usually detected with ease, though it is often difficult to determine with certainty their relation to dentition.

When similar symptoms arise at each epoch of teething, and subside with the subsidence of the gengival turgescence, teething must be regarded as the cause. Or, if the disease is such as is known to be produced occasionally by difficult teething, and if, after a careful examination, we can discover no other cause, while the gums are swollen, especially over two or more advancing teeth, it is proper to refer the disease to dentition.

It is evident that we must often be in doubt whether the disease which we are treating is due at all to the state of the gums, or, if so, whether directly or indirectly, or to what extent; but, as a rule, if any other cause is apparent, we may properly regard the influence of dentition as quite subordinate.

TREATMENT.—It is obvious that remedial measures in cases of difficult dentition must be twofold, namely, those directed to the state of the gums, and those designed to relieve the derangements or diseases to which dentition has given rise. If there is diarrhœa, this should be controlled by proper remedies, so as to reduce the number of evacuations to two or three daily. It is well to state to the friends of the child, who believe that diarrhœa is salutary during the period of teething, that this number is quite sufficient, and that more frequent evacuations will endanger the safety of the child.

The nervous affections, as convulsions, require such soothing and derivative measures as are recommended in our remarks on diseases of the nervous system. The bromide of potassium I have found especially useful and safe in cases of fretfulness and nervous excitement due to dentition. The rational employment of therapeutic measures requires strict attention to be given to the causes of disease. Therefore, the physician called to treat an ailment, believed to be due to dentition, should not fail to examine the state of the gums, and adopt such measures as will mitigate the intensity of the cause—in other words, diminish the tenderness if not the swelling of the gum. Demulcent and soothing lotions are recommended by some. The infant should be allowed to hold in the mouth an India-rubber or ivory ring, which by pressure on the gum gives considerable relief.

Mothers will often attempt to "rub through a tooth," as they term it, by means of a ring or thimble. This should be discouraged. So great friction cannot fail to have an injurious effect, by increasing the swelling and inflammation, unless the tooth has already reached the mucous membrane.

We come now to a subject which has engaged the attention of many of the ablest and most experienced physicians, and in reference to which there is still a difference of opinion among the highest authorities in medicine. I refer to scarification of the gums.

The gum lancet is now much less frequently employed than formerly. It is used more by the ignorant practitioner, who is deficient in the ability to diagnosticate obscure diseases, than by one of intelligence, who can discern more clearly the true pathological state. Its use is more frequent in some countries, as England, under the teaching of great names, than in others, as France, where the highest authorities, as Rilliet and Barthez, discountenance it.

It is well to bear in mind, as aiding in the elucidation of this subject, the remark made by Trousseau, that the tooth is not released by lancing the gum over the advancing crown. The gum is not rendered tense by pressure of the tooth, as many seem to think, for, if so, the incision would not remain linear, and the edges of the wound would not unite, as they ordinarily do by first intention within a day or two. This speedy healing of the incision, unless the tooth is on the point of protruding, is an important fact, for it shows that the effect of the scarification can only last one or two days. The early repair of the dental follicle is probably conservative so far as the development of the tooth is concerned. It may help us to understand how active, how powerful, the process of absorption is, if we reflect that the roots of the deciduous teeth are more or less absorbed by the advancing second set, without much pain or suffering from the pressure. If the calcareous particles of the teeth are so readily absorbed, what is the foundation for the belief that the fleshy substance of the gum is absorbed with such difficulty? Too much importance has evidently been attached to the supposed tension and resistance of the gum in the process of dentition.

Follicles in the period of development are especially liable to inflammation. We see this in the follicular stomatitis and enteritis, so common when the buccal and intestinal follicles are in the state of most rapid growth. Does not this law in reference to the follicles hold true of those by which the teeth are formed, so that the period of their enlargement and greatest activity, which corresponds with the growth and protrusion of the teeth, is also the period when they are most liable to congestion and inflammation? This fact affords a better explanation of the frequency of the so-called laborious or difficult dentition than that it is due to the resistance which dental evolution encounters from the gums.

If there are no symptoms except such as occur directly from the swelling and congestion of the gum, the lancet should seldom be used. The pathological state of the gum which would, without doubt, require its use, is an abscess over the tooth. As to symptoms which are general or referable to other organs, as fever and diarrhœa, the lancet should not be used if the symptoms can be controlled by other safe measures. All co-operating causes should first be removed, when in a large proportion of cases the patient will experience such relief that scarification can be deferred.

If the state of the infant is such that life is in danger, as in convulsions, or there is danger that the infant will be permanently injured or disabled, as by paralysis, every measure which can possibly give relief should be employed without delay. In these dangerous nervous affections, therefore, the gums if swollen should be lanced. I know no accidents of dentition which require prompt scarification except suppurative inflammation of the gums, convulsions, and paralysis. In other cases the operation may be safely postponed till other measures have been employed.

Second Dentition.

The fact is well established, though often overlooked in practice, that second dentition occasionally deranges the functions of organs, and gives rise to pathological symptoms. Rilliet and Barthez mention particularly neuralgic pains, rebellious cough, and diarrhœa, as effects which they have observed. Rilliet relates the case of a girl eleven years old, who had a very obstinate and protracted cough, the paroxysms lasting often half an hour to an hour. This cough immediately and permanently disappeared when the molars pierced the gums.

Dr. James Jackson, in his *Letters to a Young Physician*, says: "I have seen persons between twenty and thirty years of age much affected by a *wisdom tooth* not yet protruded, and distinctly relieved by cutting the gum. But I think the most common period of suffering from the second dentition is from the tenth to the thirteenth year. The most characteristic affections are wasting of flesh and nervous diseases. The boy loses his comeliness, and his complexion is less clear, while emaciation takes place in every part, though mostly, perhaps, in the face. The nervous symptoms are various, but the most common are a change in the temper and a loss of spirits. With these there is some loss of strength. The patient is unwilling to engage in play, and soon becomes tired when he does do it. Among the distinct symptoms which are not uncommon, I may mention pain in the head and in the eyes. The headache is not commonly severe, but it is such as inclines the patient to keep still. The eyes are not only painful, but are often affected with the morbid sensibility to which these organs are subject. I have known boys truly anxious to pursue their studies obliged to give them up on this account; and these, not having the disposition to play, will of choice pass the day with their mothers, and increase their troubles by the want of air and exercise. Nervous affections of a more severe character are sometimes manifested."

Whether the symptoms which have been attributed to second dentition have always been due to this cause, is questionable. Practically, however, it matters little, whether we recognize dentition as the cause, or assign something else. Hygienic and medicinal measures to improve the general health will usually suffice to relieve the patient. I have known a boy, pallid and of nervous temperament, about seven years old, recover immediately from a cough which had lasted for several weeks, by taking three times daily a mixture of iron and nitric acid. Many do well without medicine, simply by hygienic measures. Dr. Jackson says, "The remedies which I have found most useful are as follows: First, a relief from study or from regular tasks, yet using books so far as they afford agreeable occupation or amusement. Second, exercise in the open air, preferring the mode most agreeable to the patient, and in more grave cases the removal from town to country."

CHAPTER V.

SIMPLE PHARYNGITIS, PERI-PHARYNGEAL ABSCESS, ŒSOPHAGITIS.

Children of all ages are liable to inflammation of the pharynx. In its mildest form it often, doubtless, escapes detection in the young infant. In older patients it is revealed by pain in swallowing solid food, and more or less tumefaction below the ears apparent to the sight. It is said to be less frequent in infancy than in childhood. In the adult, and in children over the age of four or five years, inflammation of the pharyngeal surface is often confined to the portion of membrane which covers or immediately surrounds the tonsils. It occurs in connection with inflammation of these glands. But in infancy and early childhood this limitation is comparatively rare. Inflammation of the throat at this age is ordinarily a general pharyngitis, the tonsils participating in the morbid state.

Pharyngitis is primary or secondary. The secondary form occurs in measles, scarlet fever, bronchitis, croup, pneumonitis, and occasionally in other affections. As these diseases are common, physicians are oftener called to treat patients who have the secondary form than the primary. Rilliet and Barthez met eighty-three secondary to sixteen primary.

Anatomical Characters.—The pathological anatomy of pharyngitis is ascertained by depressing the tongue and inspecting the fauces. The membrane lining the fauces is seen to be redder than in health, and presenting a more or less swollen appearance, according to the intensity of the inflammation. In idiopathic pharyngitis, the fauces commonly have a bright red hue, almost like that of arterial blood. If, on the other hand, the inflammation occurs in connection with a constitutional affection, the hue is apt to be darker. In grave cases of scarlet fever or measles, it is sometimes even livid, indicating a vitiated state of the blood, a condition of real danger. The tonsils are tumefied so as to project, though not to the extent which we often observe in the adult. They are also less firm than in the normal state. The follicles of the throat are enlarged and active, pouring out a muco-purulent secretion. This is sometimes seen in a layer over the tonsil or the posterior portion of the fauces. In a case of primary pharyngitis examined after death by Rilliet and Barthez, the tonsils were softened, infiltrated with pus, and slightly enlarged. A layer of bloody mucus lay on the pharynx, and the pharyngeal surface was dark red, thickened and granular. The submaxillary glands were also swollen and somewhat softened.

If the inflammation is intense, the deep-seated portion of the tonsil becomes involved, and even sometimes the adjacent connective tissue. In most cases, by applying the finger in the hollow below the ears, the tonsil can be felt. In severe cases, also, the submaxillary glands are tumefied.

CAUSES.—The usual cause of primary or idiopathic pharyngitis is exposure to cold. It also occasionally occurs from the use of drinks too hot or containing some irritating substance. I have met it in the most intense form caused by swallowing boiling water, and, in one case, from acetic acid taken through mistake. When it occurs from the eruptive fevers, it is part of a more extensive mucous phlegmasia, although the inflammation is often, as in scarlet fever, more intense in the pharynx than elsewhere.

SYMPTOMS.—Tenderness of the pharynx, and pain on swallowing, announce pharyngitis. These symptoms are not so readily detected in infancy as in childhood. They are not always proportionate to the intensity of the inflammation. The tongue is slightly furred; there is thirst, and the appetite is more or less impaired. The breath is foul, but not fetid; the respiration is normal, or but slightly accelerated; cough is sometimes present, sometimes absent. When present, it is due to extension of inflammation to the upper part of the larynx, or to the collection of mucus around the aperture of the glottis.

When the tonsils are considerably enlarged, and the adjacent parts much swollen, the voice is sometimes much altered, presenting a nasal character. The pulse in pharyngitis is accelerated, and the temperature of the surface elevated according to the severity of the inflammation.

PROGNOSIS.—In mild cases of pharyngitis convalescence commences within a week. If the inflammation is dependent on a constitutional affection, it may continue a much longer time, especially if the glands of the neck and the connective tissue are much involved. The prognosis of secondary pharyngitis is less favorable than that of the primary form. In fatal cases there is usually a vitiated state of the blood, either from the coexisting constitutional disease, or from previous cachexia. The younger the child, also, the less favorable the prognosis.

Pharyngitis may, however, become dangerous from complications to which it gives rise. The proximity of the inflammation to the brain, or its effect upon the cerebro-spinal axis through the medium of the nerves, sometimes gives rise to clonic convulsions. In a recent case of primary pharyngitis in my practice, repeated and violent convulsions occurred in an infant, about one year old, from this cause. They commenced at the inception of the inflammation, and constituted the only real danger. Pharyngitis may interfere materially with nutrition in consequence of the dysphagia, but in most cases of primary pharyngitis this symptom does not continue sufficiently long to endanger the life of the patient. In grave constitutional affections, as scarlet fever, the difficulty of swallowing, and the consequent innutrition, augment the danger. As regards, therefore, the prognosis in simple pharyngitis, whether primary or secondary, it may be stated as a rule, that it is not, *per se*, a fatal disease, but is only so from complications, or from aggravating the primary affection with which it is associated.

DIAGNOSIS.—This is never difficult provided attention is directed to the throat; but the physician often fails to discover it at his first visit, from neglecting to examine this part. In many cases the local symptoms are not well-marked, and in the absence of these the febrile reaction may at first be referred to some other cause than the true one. Inspection not only reveals the presence of inflammation, but enables us to determine whether it is simple pharyngitis, or diphtheritic, or ulcerative. In some instances, simple pharyngitis resembles diphtheritic, from the presence of confervoid growths upon the inflamed surface, usually the lepothrix buccalis. The differential diagnosis is based on the easy removal and soft pultaceous character of the confervæ, and the appearance under the microscope.

TREATMENT.—*Mild* cases of simple pharyngitis require little treatment. With moderate counter-irritation over the throat, and the use of laxative medicines, the inflammation soon subsides.

The linimentum camphoræ may be occasionally rubbed over the throat, and retained upon it by flannel. The effect is increased by the application, once or twice daily, of mustard or tincture of iodine, or by adding to the liniment a little volatile liniment or turpentine. Mucilaginous and refrigerant drinks, with a light diet, suffice to complete the cure.

In the *severe* form of idiopathic pharyngitis more active measures are required. The bowels should be freely opened, warm mustard pediluvia occasionally employed, and the head be kept cool. If the patient is robust, as in the first stages of the disease, and there is threatening of cerebral complication, it is proper to apply one or more leeches to the temples or neck; but cases requiring such depletion are exceptional.

Diaphoretics and sometimes cardiac sedatives are indicated, such as liquor ammoniæ acetatis, spiritus ætheris nitrosi, ipecacuanha, tartrate of antimony and potassa, aconite, and veratrum viride. Medicines of this kind may be variously combined according to the age and condition of the patient, and the severity of the disease. Saline laxatives are also in some cases useful.

As the symptoms abate, the intervals between the doses may be increased. In those cases of severe idiopathic pharyngitis attended by pain in deglutition, moderate but constant counter-irritation should be employed over the seat of inflammation. An excellent application, and one much used in families, is a slice of fat salt pork, cut as thin as possible, stitched on a single thickness of muslin, and applied from ear to ear. It is better, usually, to sprinkle more salt upon it, and sometimes powdered camphor.

In cases of much tenderness and dysphagia great relief is often obtained by emollient poultices applied over the throat. Mustard or iodine may also be occasionally employed in addition if there is not already sufficient counter-irritation.

Topical treatment of the pharynx is recommended by most authors. Rilliet and Barthez use for this purpose nitrate of silver or powdered alum. The former has been most employed by physicians. It may be applied in the proportion of ten grains to the ounce, two or three times daily. I have commonly prescribed the liquor ferri subsulphatis mixed with three or four times its quantity of glycerine, for application to the inflamed part, and with a good result.

Gargles, which we so often prescribe in the pharyngitis of adults, cannot be satisfactorily employed in infancy and early childhood.

The treatment of secondary pharyngitis will be described in connection with the treatment of the diseases which it complicates. Suffice it here to say that this form of inflammation must not be treated by those depressing remedies which are useful in certain cases of idiopathic pharyngitis.

Pseudo-membranous pharyngitis, or diphtheria, being a constitutional disease, has been described elsewhere.

Peri-Pharyngeal Abscess.

Every practitioner should bear in mind the fact that an abscess occasionally forms between the pharynx and vertebral column (retro-pharyngeal), or upon the sides of the pharynx in the submucous connective tissue. This constitutes a disease which is apt to be fatal, but which can ordinarily be promptly relieved by the surgeon.

Yet, if we look over the records of peri-pharyngeal abscess, we shall see that in a large proportion of published cases, the disease was supposed to be something else, and so treated until its nature was revealed by post-mortem examination. The most complete monograph on this disease with which I am acquainted was published by Dr. Allin, of this city, in the *N. Y. Journ. of Med.* for Nov. 1851, under the title of retro-pharyngeal abscess. To this paper I am largely indebted for facts.

AGE—CAUSE.—This disease may occur at any age; but it is most common in infancy and childhood. It is more frequent in the first year of life than at any other period. Of the cases collated by Dr. Allin, in which the age is stated, twenty were under ten years, while the number for all other ages was twenty-one. This disease arises in some patients from caries of the vertebral column, and, in others, from inflammation commencing with the mucous membrane of the pharynx, and extending to the submucous connective tissue. Whichever the cause, there is usually a scrofulous or reduced state of system.

Writers describe two kinds of peri-pharyngeal abscess, the primary and secondary. This distinction is based on the fact, whether or not the inflammation which leads to the abscess is dependent on an antecedent pathological state.

In the primary form the cause is usually atmospheric, or it is some irritating substance which has been swallowed, and which, lodging in the pharnyx, produces pharyngitis.

The cause is mentioned in twenty cases of the primary form, collated by Dr. Allin, as follows: exposure to cold, ten cases; lodgement of bone in pharynx, eight cases; blow with a fencing foil, one case. In the last case, the button of a fencing foil passed through the right nostril into the pharynx.

The secondary form occasionally occurs after measles and scarlet fever. The inflammation of the pharynx, common in those diseases, extends to the subjacent connective tissue, and, aided by the dyscrasia of the patient, becomes suppurative. Such cases have been observed by Rilliet and Barthez. The most common cause of the secondary form is, however, caries of the vertebral column.

When thus occurring it is similar, both as regards cause and nature, to lumbar abscess. It would follow the same chronic course, and would properly be described in connection with it, were it not for its proximity to the air passages, which renders the disease so rapid and fatal. In a few recorded cases the abscess has been a sequel of erysipelas. It is believed by some that when it thus occurs there is retrocession of the erysipelatous eruption. In nineteen cases of secondary abscess in Dr. Allin's collection, the cause is assigned as follows: erysipelas of face, two; inflammation following a fall upon the inferior maxilla, one; after cerebritis, one; syphilis, four; caries of the cervical vertebra, six; scrofula, five.

The proximate cause of peri-pharyngeal abscess is believed by Mr. Fleming (*Dublin Journ. of Med. Sci.* vol. xvii.) to be in some instances inflammation of small lymphatic glands lying in the connective tissue external to the pharynx. After remarking that two cases which he reports lend confirmation to this view, he continues: "That those glands are only occasionally found in this situation, I admit, and hence, probably, the rare occurrence of this particular form of disease, but that they exist more frequently than is generally imagined, I am equally certain." Prof. Geo. T. Elliot relates a case (*Obstet. Clinic, N. Y.*, Appleton & Co., 1868) in which peri-pharyngeal abscess immediately followed and was apparently due to parotiditis. The patient was a boy seven months old.

In rare instances the abscess, or the local disease which leads to it, appears to exist from birth. Thus, Dr. E. O. Hocken relates, in the *Prov. Med. and Surg. Journ.*, 1842, the history of an infant who died at the age of nine weeks. It had always, when taking the breast, thrown back its head as if nearly suffocated. The walls of the abscess were thick and firm, described by the writer as cartilaginous. Occasionally there is no apparent cause of the abscess. We must then attribute it to some unknown dyscrasia.

ANATOMICAL CHARACTERS.—The seat of the abscess is not the same in all cases. The swelling can ordinarily be seen on examining the fauces, but occasionally it is so low as to be really peri-œsophageal, and therefore invisible. The size of the abscess varies; sometimes it is large, pressing inward the wall of the pharynx even against the velum palati and into the posterior nares, if the abscess have a high location, or, if lower, against the larynx, so as to embarrass respiration. Sometimes the abscess is so large or has such lateral extension that there is external swelling along the side of the neck. In a few cases on record the pus, instead of being discharged into the pharynx, made its way down the neck between the muscles and the connective tissue to the pleural cavity, which it entered, producing fatal pleuritis.

The walls of the abscess have been found in a different state in different cases. Sometimes the sac, at the projecting point, is so thin that it seems as if there might have been a spontaneous cure, could life have been preserved a few hours longer. In other cases the sac is so thick and firm that its rupture, for many days, would be impossible.

SYMPTOMS.—The precursory symptoms differ in different cases, according to the nature of the cause, whether it be pharyngitis, glandular inflammation, or vertebral caries. If the abscess proceed from caries, it is preceded by deep-seated and protracted pain, greatly increased by movements of the head.

The patient with this disease is restless, his mouth hot and dry; tongue furred; deglutition more or less difficult. Sometimes after suppuration has occurred there are alternations of heat and chills. The symptoms indicate approximately the seat of the inflammation, but on examination we do not find that degree of redness and swelling of the mucous surface which we had been led to expect. The tissues which are chiefly involved in the inflammation, being submucous, are hidden from view. We observe redness of the pharynx, but it is disproportionate to the intensity of the symptoms. Sometimes there is a sensation of chilliness through the entire period of the abscess, though greater at one time than at another, and occasionally convulsions occur, especially in young infants. In ordinary cases the embarrassment of respiration is one of the first and most conspicuous of the symptoms, and it is the cause of the chief danger. It becomes more and more marked as the abscess increases. It is noticed both during inspiration and expiration. The dysphagia also increases, sometimes to such a degree that drinks are taken with difficulty, and solid food refused. The respiratory symptoms bear considerable resemblance to those in protracted laryngitis, for which this disease has been mistaken. While the respiration becomes impeded or whistling, the voice is also feeble or indistinct, from the pressure of the tumor.

But the symptoms described above are not all present in every case. They vary according to the size and location of the abscess, whether it be high or low, posterior or lateral. I have met the disease in a child old enough to express its subjective symptoms, in whom there was little or no dysphagia, and others report similar cases. When the tumor has attained such a size as to produce well-marked symptoms and jeopardize the life of the patient, it, or a part of it, can ordinarily be seen on depressing the tongue, but usually its location and condition can be better ascertained by exploration with the finger. The dyspnœa increases as the abscess enlarges, and, after a time, unless it bursts spontaneously or is opened by the surgeon, imperfect oxygenation of the blood results. In some patients paroxysms of dyspnœa occur, so as to threaten immediate suffocation; coughing or attempts to swallow induce these paroxysms, and the patient is forced to remain in an erect or semi-erect posture. The tongue is protruded, the head thrown back, the pulse is frequent and rapid, the limbs become livid and cool, and finally death occurs from apnœa. Occasionally, when death seems inevitable, the abscess gives way by the struggles of the child, and the patient is restored to health. In rare cases the result is different. The trachea and bronchial tubes are deluged by the purulent discharge, and immediate suffocation occurs. The following was an example: In May, 1871, a boy two years and five months old was brought to the Clinic at Bellevue, who had had the symptoms of an abscess for three months. The head was carried one side, its rotation caused pain, and a laryngeal râle accompanied respiration. The upper part of the tumor could be detected by the finger, but, on account of its low location, it was impossible to open it with the bistoury. The temperature was 103°, pulse 156. The case was kept under observation, but in a few days the dyspnœa suddenly became so urgent that death was imminent, when the attending physician of the class, Dr. Swezey, broke the abscess with his finger, and pus was ejected on the floor; death, however, occurred almost immediately.

A correct appreciation of the symptoms and the nature of peri-pharyngeal abscess will be best obtained by relating a case. I select the following from the *Transactions of the London Pathological Society*, October 20th, 1846:—

A female infant died at the age of seven months, having had difficult breathing three weeks, and extreme dyspnœa during the last days of life. The dyspnœa was constant, and was aggravated by mental excitement, by movements of the body, and by exposure to cold. During the paroxysms, a peculiar, croupy sound accompanied inspiration. There was no dysphagia through the entire sickness, and death occurred from apnœa.

The sac of the abscess was of the size of a pigeon's egg, and was situated between the upper cervical vertebræ and the back of the pharynx. The abscess was flattened in front, so as not to cause any material prominence of the wall of the pharynx. From the sac a second small cyst extended forward, forming a nipple-like swelling in the pharynx, which completely closed the orifice of the glottis. Its aperture of communication with the body of the abscess admitted the point of the little finger, and the whole swelling was freely movable and perfectly translucent at its extremities and sides. The abscess might have been easily punctured, with probably the preservation of life.

The *duration* of this disease is very different, according to the severity of the inflammation, the rapidity with which the abscess enlarges, and the direction which it points. A lateral or downward extension is not so immediately dangerous to life as the anterior.

The time when the abscess begins to form cannot be precisely ascertained, and most writers, in determining the duration of the disease, compute from the first appearance of symptoms which are referable to the pharynx. Dr. J. Bryne relates, in the *Amer. Journ. of Med. Sci.*, 1838, a fatal case in which the disease had apparently continued only about one week. The patient was an infant one year old, and died of apnœa. The abscess was large, extending from the base of the skull to the thorax, and pressing both on the larynx and trachea. M. Besserer (*Archiv. Gén. de Méd.*, 1840) gives the history of an infant four months old, who died in the same way after thirteen days. An infant nine months old, whose case was published by Dr. W. C. Worthington, in the *Prov. Med. and Surg. Journ.*, 1842, lived nine days. The abscess occurred from exposure to cold; the patient was treated for croup, and died from suffocation. The anterior wall of the abscess was very thin. Since the first edition of this book was published, I have met three patients with this disease in whom the pus was evacuated when the dyspnœa had become urgent. In two the symptoms indicated a continuance of the disease from two to four weeks, and in the third case four months.

When the abscess grows slowly, and presses lightly on the air-passages, the case may continue for months. Such a one was observed by Prof. Willard Parker (Allin). This infant was one year old; it suffered from pharyngeal symptoms nine months, was treated for tonsillitis, and death occurred as usual from apnœa. The abscess was two inches long, and there was no disease of the vertebræ. The same surgeon saved the life of another patient four years old, in whom the disease was chronic, by puncturing the abscess; and Prof. Post, of this city, also treated successfully a case which had continued three months. (Allin.)

DIAGNOSIS.—The diagnosis of this disease is ordinarily not difficult, provided the physician examine carefully and bear in mind the occasional occurrence of such an abscess. In a large proportion, however, of the recorded fatal cases, the true nature of the disease was not recognized during life. Especially is the diagnosis difficult when the cerebro-spinal system is early implicated, and symptoms arise which divert attention from the throat to the brain.

The diseases with which peri-pharyngeal abscess is most frequently confounded are laryngitis and simple but severe pharyngitis. From laryngitis, for which it has been most frequently mistaken, it may be distinguished by the dysphagia and by the character of the initial symptoms. In laryngitis there is usually the peculiar cough from the first or very early, while in abscess there is a period of several days or even weeks before respiration is materially affected.

In abscess pressure of the larynx backward is badly tolerated, greatly increasing the dyspnœa, while in pharyngitis and croup this effect is not so marked. In abscess the horizontal position aggravates the dyspnœa, but not in pharyngitis and croup. The character of the voice will also aid in diagnosticating abscess from laryngitis, since in the former it is apt to be nasal, and in the latter hoarse or whispering. The decisive test is afforded by inspection and digital exploration. The tumor is seen, or, if situated too low to be seen, is felt, upon the walls of the pharynx.

If the symptoms of abscess are masked by those arising from the cerebro-spinal system, as by convulsions, the priority of the pharyngeal symptoms will serve to aid in determining the true disease.

In a case of suspected abscess the physician should not only carefully inspect the fauces, but should employ digital examination. The finger will sometimes detect fluctuation when no evidence of an abscess is presented to the eye. Two cases observed by Prof. Elliot (*Obstet. Clinic*, p. 420) were examples in point.

Prognosis.—With proper treatment the result is usually favorable, but, if the disease is not recognized, the majority die. In Dr. Allin's cases, of those under the age of twelve years nine died, while ten recovered by the opening of the abscess by the lancet, trocar, or finger, and one by its spontaneous rupture.

If the abscess is due to disease of the spinal column, death may occur immediately after the sac is opened, the caries of the intervertebral cartilages producing, according to Dr. Allin, dislocation of the vertebræ. Death may alſo occur, though rarely, from pleuritis, in consequence of the bursting of the abscess into the pleural cavity. Even in caries, if the sac is properly opened, and if need be reopened, recovery is possible, as in a case treated by Prof. Post.

Treatment.—The proper treatment of peri-pharyngeal abscess is simple, consisting in breaking or puncturing the sac by the finger, the lancet, bistoury, or pharyngotome. Each method has been successfully employed. In the majority of cases the proper way to open the abscess is by the ordinary curved scalpel or bistoury, which should be covered by a strip of adhesive plaster to within a half inch of the point. If the abscess is post-pharyngeal, it should be opened in the median line. A single incision suffices to evacuate the pus. If the abscess points or is elastic, there is little danger of wounding any important vessel or producing dangerous hemorrhage if the operation is properly performed. It may be necessary to open the abscess more than once, as in a case reported by Dr. Post, and another which I saw with Dr. Livingston of this city. In certain cases, when the knife can not be readily employed, the abscess may be opened by pressure with the finger nail or the edge of a teaspoon.

Patients with this disease ordinarily require constitutional treatment, especially the use of tonics, ferruginous and vegetable. The citrate of iron and quinine, the citrate of iron and ammonia, and in strumous cases the syrup of the iodide of iron with cod-liver oil, are eligible preparations. Nutritious diet and often alcoholic stimulants are required.

Œsophagitis.

Disease of the œsophagus in infancy and childhood is comparatively rare, inflammation being the most frequent affection of this portion of the digestive tube in these periods, and, indeed, the only one which claims attention. It is most common in infants under the age of three or four months, who are deprived of the breast milk, and are given a diet which is with difficulty digested, and perhaps taken too hot or too cold. It is, therefore, most frequent in foundling hospitals. I have frequently observed it in the Infant's Hospital, and the Nursery and Child's Hospital, of this city, chiefly at the autopsies of bottle-fed infants, under the age of six months, whose symptoms had indicated disease or derangement of the digestive function. Many of them had diarrhœa, and died in a state of emaciation. Œsophagitis in these cases was associated with simple or gangrenous stomatitis, thrush, or with gastritis or entero-colitis. Sometimes all these inflammations coexisted. In a few cases the confervoid growth of thrush had extended from the mouth to the œsophagus. It occurred in small hemispherical masses, scarcely as large as a pin's head. Swallowing corrosive or strongly irritating substances, as the acids or alkalies, is an occasional cause of œsophagitis, the irritant at the same time producing stomatitis and gastritis.

Anatomical Characters.—The inflamed surface sometimes presents a uniformly injected appearance. Usually, however, there is greater intensity of inflammation in streaks or patches than over the surface generally. I have frequently observed at autopsies a greater degree of inflammation in the lower than upper half of the œsophagus, even when the infant had stomatitis at the time of death.

Œsophagitis occurring from faulty regimen or anti-hygienic conditions is not accompanied by as much thickening of the walls of the tube as often occurs in some other portions of the digestive canal, as, for example, in the colon. In diphtheritic inflammation of the œsophagus there are more submucous infiltration and thickening of the mucous membrane than in simple œsophagitis.

Occasionally ulcerations of the œsophageal mucous membrane are observed in the lower part of the tube, and Billard describes the ulcerative form of œsophagitis. At the first autopsies at which I observed these ulcers, I supposed that they were pathological, and indicated a severe grade of inflammation; but a more extended observation has convinced me that they are usually post-mortem, and are not at all dependent on inflammation of the œsophagus. The solvent power of the gastric juice not only causes ulceration in the stomach, but entering the œsophagus may and not infrequently does produce a solvent action on the mucous tissue there. At the meeting of the London Pathological Society, March 4th, 1852, Dr. Graily Hewitt presented a specimen in which the gastric juice had not only eaten entirely through the coats of the œsophagus an inch above the stomach, but had even attacked the left lung. Over the age of six months inflammation of the œsophagus is rare.

The symptoms of œsophagitis, in those young and emaciated infants in whom it ordinarily occurs, are not well pronounced. If they have pain in deglutition, or tenderness on pressure over the œsophagus, it is not apparent. Nor have they seemed to me to vomit oftener than other infants of this class suffering from indigestion and gastro-enteritis, without œsophagitis. It is, therefore, difficult to diagnosticate œsophagitis. It is, according to my observation, oftener present than absent in spoon-fed infants of three months or under who have persistent stomatitis and entero-colitis.

TREATMENT.—In the œsophagitis of foundlings and ill-nourished infants, which arises, as has been stated, from faulty regimen, no treatment is required apart from that designed to relieve the stomatitis or entero-colitis with which it exists. Attention must be directed mainly to the diet and hygienic management. The remedial measures are more fully detailed in our remarks on entero-colitis. Œsophagitis produced by swallowing corrosive or highly irritating substances requires the same treatment as in the adult, namely, poultices, demulcent drinks, perhaps leeches, etc.

CHAPTER VI.

INDIGESTION, CONGESTION OF STOMACH, GASTRITIS, FOLLICULAR GASTRITIS, DIPHTHERITIC GASTRITIS, POST-MORTEM DIGESTION, SOFTENING.

INDIGESTION is much more common during infancy than in any other period of life. While the digestive organs in the adult easily assimilate a great variety of food, it is necessary for the well-being of the infant that its diet be simple and carefully prepared. Departure from this rule leads to indigestion and ulterior diseases.

After the age of two years a mixed diet is readily assimilated, the digestive function less frequently disordered, and indigestion presents few peculiarities to distinguish it from that of the adult.

Indigestion in some children is habitual; in others the digestive process is ordinarily well performed, but, from some temporary derangement of system or error of diet, an acute attack of indigestion occurs. Hence, two forms of this ailment may be described: first, acute, referring to temporary attacks; secondly, chronic, referring to the habitual state.

CAUSES.—The causes of indigestion are twofold: first, the concondition of the digestive function independently of the aliment; secondly, the unwholesome or improper character of the ingesta. Anything which lowers the vital powers may be a predisposing cause of indigestion, by impairing the functions of some of the organs which assimilate the food. Impure air and personal uncleanliness, protracted hot weather, and previous disease, are among the common predisposing causes. The strong country child can thrive upon a diet which, given to the more feeble child of the city, would produce deleterious results. During the summer months it often happens that an infant in the city cannot digest properly any food given to it except the mother's milk; and from this results much of the infantile sickness and mortality which make this season of the year so much dreaded by parents. There is a natural difference in children, as regards liability to disordered digestion. Some do well upon a diet which given to others similarly situated occasions vomiting, gastralgia, and flatulence.

In the majority of cases of indigestion, however, the fault does not exist in the child. It is fed too often or irregularly, or upon a diet that is unwholesome or indigestible. It is well known that the milk of the mother or the wet-nurse is liable to changes which render it for the time unsuitable for the infant. Her food may be of such a quality, or her mind so excited, or some function of her system so disordered, as to effect a temporary change in the constitution of the milk. The occurrence of the catamenia, or of gestation, in mothers who are suckling, not infrequently produces this unfavorable result.

Indigestion is most common in those infants who, deprived of the mother's milk, are intrusted to wet-nurses, or fed from the bottle. The milk of the wet-nurse, from not agreeing with the age of the infant, from irregularity in her mode of life, from the acescent nature of her food, or from other causes which are not appreciable, may disagree with the infant, and be imperfectly digested.

The most common cause of indigestion in the infant is artificial feeding. This, in the cities, is productive of a great amount of gastric and intestinal derangement and disease. The younger the infant, the less likely is it to thrive if brought up by hand.

Whatever care may be bestowed in the preparation of its food, whether cow's or goat's milk or farinaceous substances be used, there is seldom that healthy nutrition which is observed in infants who receive the natural aliment. The "swill milk" in common use among the poor families of this city is totally unfit for children of any age, and is apt to produce flatulence, acidity, and indigestion. Acute indigestion occurs in children of any age from food unsuitable in quality or quantity, which produces gastralgia and other symptoms to be detailed hereafter. Those who suffer habitually from mal-assimilation are especially liable to such acute attacks.

In the period of childhood, chronic indigestion is much less frequent than in infancy, but children are, perhaps, more subject than infants to the acute form. This is induced by ingesta taken in too large quantity, or of a kind which is with difficulty digested. Cherries, currants, raisins, the parenchyma of oranges and lemons, dried fruits and confectionery, which are so often heedlessly given to children, are common causes of acute attacks of indigestion. These substances, being but partially digested or not at all, and sometimes accumulating for days in the stomach or intestines, may lead to a very serious and dangerous condition.

SYMPTOMS.—The *nursing* infant, if the milk continually disagree with it, is fretful. It has a discontented aspect. It seldom smiles, and is not amused by playthings, or is only amused for a short time. Its features are pallid, and bear the appearance of faulty nutrition. Its body and limbs are more or less wasted, or are soft and flabby. Vomiting is frequently present, and sometimes a large mass or masses of caseum are ejected, which have evidently lain a considerable time in the stomach. The bowels may be constipated or loose, and the evacuations are unhealthy. This state of the infant continuing prevents the necessary rest of the mother, and may affect unfavorably her health, so as to reduce the quantity of her milk, or render it still more unwholesome.

In addition to the habitual indigestion, these infants sometimes have acute attacks, similar to the acute dyspepsia of adults, and which have been described by writers as gastralgia or enteralgia. Their countenance indicates suffering; they utter sharp cries, and their thighs are drawn over the abdomen, indicating the seat of the suffering. Flatulence is common. By vomiting or an evacuation from the bowels, the offending substance is removed, and the pain subsides.

Indigestion in the *spoon-fed* infant is similar to that in the infant who nurses, except that it is ordinarily accompanied by symptoms of greater gravity and persistence, and there is in the spoon-fed more liability to the acute attacks.

In those who have advanced beyond the age of infancy, chronic indigestion is less frequent than in infants, but as the diet of such children is prepared with less care, and is less restricted, they are very liable to attacks of temporary indigestion. These come on suddenly, and sometimes are so severe as to endanger life. The child, previously well, is suddenly seized with languor; the pulse becomes accelerated, the face flushed, and surface hot. Drowsiness compels him to seek the bed, where he lies with his eyes shut. He sometimes has headache, and a sensation of oppression in the epigastrium. The nervous system is not unfrequently affected, as shown by tenderness of a neuralgic character of the body and limbs, sudden twitching of the limbs premonitory of convulsions, and occasionally severe and repeated convulsions. These alarming and really dangerous symptoms speedily subside on the removal of the cause. One of the most severe attacks of eclampsia which I have seen occurred in a boy eight or ten years old, induced by swallowing the parenchymatous portions of oranges which he had been in the habit of eating, and which had accumulated in the stomach and intestines. The expulsion of the offending substance gave immediate relief.

Sometimes, but not often, the symptoms of acute indigestion closely resemble those of pneumonitis. For example, an infant, whom I once treated, was seized at night with fever, hurried respiration, and the expiratory moan, which some writers consider pathognomonic of pneumonitis or pleuritis. These symptoms subsided when the bowels were freely opened, and currants, which had been eaten the previous day, were expelled.

As the child advances in years and its general health improves, the digestive function is less frequently disturbed. After the age of three or four years the disease which we are considering becomes one of much less frequency and importance than in infancy and early childhood.

Indigestion leads to some of the most common and serious affections of early life. In the infant, if it continue a considerable time, inflammation of the buccal, œsophageal, or gastric mucous membrane, or of some part of the intestinal tract, ordinarily occurs. In the young infant thrush soon makes its appearance, and, whatever the age, the cachexia which results from continued indigestion increases the liability to organic affections. Eclampsia is the most serious, and at the same time a frequent, result of temporary or acute indigestion.

Prognosis.—In simple indigestion this is good. It is doubtful or unfavorable when ulterior diseases occur, and in proportion to their gravity.

Treatment.—The first indication in treatment is obviously the removal of the cause. In *acute* indigestion, when there is reason to believe that there is some offending substance in the stomach or intestines, if the symptoms occur soon after the substance is taken, an emetic may be administered, and ipecacuanha, in syrup or powder, is safe and usually efficient. If several hours have elapsed, a purgative should be given, as castor oil, or calomel, either alone or in combination with syrup of rhubarb.

If the symptoms are urgent, especially if convulsions are threatened, we should not wait for the slow action of a purgative, but should resort to enemata to open the bowels. Sometimes the pain in acute indigestion is such as to require the use of opiates. In the infant there is often an excess of acid in the stomach and intestines, which is best treated by alkaline remedies, as lime-water in combination with the opiate. The following mixture will be found useful in such cases:—

℞. Tinct. opii, or liq. opii compos. gtt. xij;
Magnes. calcinat. gr. xij;
Sacch. alb. ʒij;
Aq. anisi ℥iss. Misce.

Dose, the bottle being first shaken, one teaspoonful from two to four hours to a child a year old. If there is much pain, it is well to add a little chloroform or Hoffman's anodyne to the mixture.

If in the acute indigestion of infants there is diarrhœa, the camphorated tincture of opium in combination with chalk mixture should be given instead of the above, fifteen drops of the one to a teaspoonful of the other. Infants whose diet properly consists largely of milk, digest with most difficulty the caseum, which is apt to pass the bowels in an imperfectly digested state, or to collect in a large and firm mass in the stomach, causing gastralgia and rendering the child fretful till it is vomited. I have elsewhere recommended as important to prevent these attacks of acute dyspepsia, the use of the upper third of the milk, which contains less than the average caseum, and the addition of an alkali to the milk, which retards the coagulation till it begins to be acted upon by the gastric juice, and tends to prevent the formation of large and firm caseous coagula in the stomach.

In *chronic* indigestion the means of relief are different. They are twofold: first, as regards change of diet; secondly, measures to improve the digestive function. Spoon-fed infants, suffering from habitual indigestion, require the utmost care as regards the character of their food, its preparation, and the times of feeding. Often it is best, if practicable, to procure a wet-nurse, and sometimes removal to a more salubrious locality is followed at once by improvement in the digestive function. If the infant is already wet-nursed, the milk should be examined microscopically and otherwise, and inquiry should be instituted in reference to the health and diet of the wet-nurse. Sometimes a change of wet-nurse is advisable. For facts and considerations bearing on this point, the reader is referred to the chapters relating to regimen.

Infants, as well as children, with chronic indigestion are occasionally much benefited by the moderate and judicious use of alcoholic stimulants. They should be given sparingly with their food, and should be discontinued as soon as the digestive function is fully restored. M. Donné and some other French writers recommend the habitual use of wine for infants even in a state of health, but there are reasons, moral as well as physical, why alcoholic stimulants should only be used as medicines, and never in a state of health.

If the case is one of simple or uncomplicated indigestion, tonics, either the mineral or vegetable, may be employed. In many instances, however, especially in infancy, gastro-intestinal inflammation has supervened, and in such cases those tonics should be employed which exert a favorable, or, at least, not an unfavorable effect on the hyperæmic and irritable surface over which they pass.

When indigestion is simple, or accompanied by no serious complication, wine of iron, citrate of quinine and iron, and the elixir of calisaya bark, may be mentioned among the safe and efficient agents to improve the digestive function. The following is also a good formula for cases of simple indigestion:—

℞. Ferri citrat. gr. xvj;
Bismuth. citrat. gr. xlviij;
Aquæ ℥ij. Misce.

Dose, one teaspoonful three or four times daily to a child of two or three years.

The ferruginous preparations are most efficacious in cases which are attended by signs of anæmia.

Among the useful vegetable stomachics and tonics may be mentioned the compound tincture of cinchona, compound tincture of gentian, infusion of columbo, fluid extract of columbo, and fluid extract of cinchona.

If chronic indigestion is complicated with gastro-intestinal inflammation, subacute or chronic, for this is the form which is usually present, there are still certain tonics which may be advantageously administered. Columbo and the compound tincture of cinchona are often useful in these cases, and of the chalybeates wine of iron or the tincture ferri chloridi, in small doses, may be safely administered. But the remedy which I have found most serviceable, both as a tonic and for the inflammatory disease, is tincture of columbo in combination with the liquor ferri nitratis, given every four hours according to the formula contained in our remarks on the treatment of intestinal inflammation.

I have not alluded to the use of pepsin as a remedial agent in indigestion. The theory of its employment in atonic states of the stomach is good, but physicians in this country have, in most instances, failed to observe that benefit from its use which they had been led to expect, and which seems to have followed its employment in the practice of some of the European physicians. Perhaps the result would have been better had fresher and better preparations of pepsin been prescribed. Boudault's pepsin from Paris has been most used in this country, but ordinarily I believe without appreciable benefit. I prescribed it in doses of two or three grains, several times daily, to foundlings from one to three months old in the Infant's Hospital, but the infants to whom it was given did not appear to do better than those from whom it was withheld.

The American pepsin, prepared under the intelligent supervision of Dr. James S. Hawley, can be obtained in the shops in the form of a powder and wine. From its freshness and better taste it possesses advantages over the French preparations.

Infants affected with diarrhœa from indigestion I have often observed to improve under the use of powders consisting of equal parts of subnitrate of bismuth and the American pepsin, but the benefit was perhaps more due to the former than the latter agent.

An infant of three months can take three grains of each every three hours, and one of twelve months six or eight grains.

Dyspepsia often rapidly disappears by hygienic measures without the use of medicines, as by removal from the city to the country, out-door exercise, or, if the patient is an infant, by being carried into the open air daily. In infants, also, marked improvement is often observed on the approach of the cool and bracing weather of autumn and winter.

Congestion of the Stomach.

Passive congestion of the stomach is described among the diseases of this organ by Billard; but it is a pathological state of little importance in itself. It occurs in new-born infants, asphyxiated at birth and with difficulty resuscitated. In these cases there is generally intense capillary congestion throughout the system. The mucous membrane of the stomach is injected, but not more than that of the mouth or intestines. If circulation and respiration are fully established, this injection of the capillaries subsides. No treatment is required, except measures to promote the circulatory and respiratory functions. In cyanosis and atelectasis there is often general congestion of the capillaries of the systemic circulatory system, on account of the obstruction to the flow of blood through the heart in the one disease and through the lungs in the other. There is in these cases passive congestion of the stomach, but not more than of the other organs.

Gastritis.

Inflammation of the stomach, except when produced by the direct contact of some irritant, is rare in infancy and childhood, independently of disease in some other portion of the intestinal tract. Cases have, however, been reported in which it was not known that any irritating ingesta had been taken, and in which a careful examination revealed a healthy or nearly healthy state of other portions of the digestive tube. The subjects were, for the most part, young infants. The following is an example related by Billard:—

An infant, four days old, remarkable for the color of his face and firmness of flesh, refused the breast and vomited yellow, acid matter. On the following day the vomiting had increased, the legs were œdematous, face pale and pinched, respiration difficult, skin cold, pulse slow and irregular, and pressure on the epigastric region produced cries indicative of pain.

Third day: general sinking; face thin and expressive of great pain; stools natural.

Fourth and fifth days: condition the same. Death occurred on the sixth day, and the autopsy was made on the day following.

With the exception of slight pneumonitis, no disease was discovered in any part of the system besides the stomach. The mucous membrane of this organ was intensely vascular near the cardiac orifice and along the lesser curvature. It was also tumefied, and could be easily raised with the nail. In the remainder of this organ there was strongly-marked capilliform injection.

This case is interesting as showing what may happen, though rarely. A nursing infant is seized with gastritis without apparently having taken any irritating ingesta, and without other disease of the digestive apparatus. It is probable, however, that, in cases like the above, the cause, if ascertained, would be found in the ingesta: perhaps drinks too hot, perhaps elements of colostrum, or pathological elements in the milk, which might produce gastritis in young infants in whom the mucous membrane is delicate and sensitive.

Gastritis is not uncommon in infancy in connection with inflammation of the intestines. The latter inflammation is sometimes apparently subordinate to the former, and, if such patients die, the fatal result is due mainly to the gastric disease.

Causes.—Gastritis as I have observed it in infants has been in most cases due in great part to the continued use of improper food, of food not suitable to the age of the child, and which was, therefore, with difficulty digested. Milk, acid or otherwise unwholesome, farinaceous substances, stale or of an inferior quality and not properly prepared, drinks too hot or too cold, may be specified among the causes. Therefore, this disease is most common in bottle-fed infants, and is comparatively rare in those who receive abundant and wholesome breast milk. Anti-hygienic agencies, apart from the diet, no doubt exert some influence in the production of gastritis, as they do of stomatitis. Uncleanliness, residence in damp and dark apartments, and in an atmosphere loaded with noxious gases, produce a condition of system which strongly predisposes to these inflammations, if, indeed, they may not be enumerated among the direct causes.

Rilliet and Barthez have called attention to the fact that certain medicinal substances given to children occasionally cause gastritis. They have observed this effect from the use of tartar emetic, Kermes mineral, and croton oil. Gastritis occurring in this way may or may not be associated with inflammation in contiguous portions of the digestive tube. Elsewhere I have related a case in which gastro-enteritis occurred in a child nine years old, after having taken a considerable quantity of kerosene oil for spasmodic croup.

Inflammation of the stomach is thought by some to accompany measles and scarlet fever during the eruptive period, though the proof of this is not decisive. If it occur, it corresponds with the stomatitis and cutaneous inflammation of those diseases, and disappears as they subside. It is mild, and accompanied by few symptoms. I have, however, already stated, in the remarks on scarlet fever, that I have in a few instances examined the stomachs of those who had died during the eruptive period of these diseases, and found them free from any appreciable inflammatory lesion.

AGE.—From the records of about seventy cases of inflammatory disease of the digestive mucous membrane which I have preserved, it appears that gastritis is rare over the age of six months. On the other hand, it is not uncommon in infants under the age of three months who are deprived of the breast milk. I have met it chiefly in foundlings fed with the bottle, and having at the same time entero-colitis and often also stomatitis and œsophagitis. In these cases there is sometimes continuous or almost continuous injection and thickening of the mucous membrane, from the lips to near the pyloric orifice of the stomach and even beyond this orifice in the intestines. The following is an example of gastritis as it frequently occurs in foundling institutions:—

CASE.—R.W., female, two weeks old, was admitted into the New York Infant Asylum, August 24th, 1865, anæmic and somewhat emaciated. It was in part wet-nursed, and in part bottle-fed. The emaciation increased, and nearly the entire buccal cavity became covered with the confervoid growth of thrush. On September 4th, diarrhœa commenced. Borax was used for the mouth, and alkalies and astringents to check the diarrhœa, but without material improvement.

The following was the record for September 7th: "Cries almost constantly, with feeble or whining voice; still has thrush; nurses and does not vomit; dejections five or six daily, and green; pulse 136, feeble." Death occurred September 8th.

Autopsy September 9th.—Mouth and fauces not examined; mucous membrane of œsophagus vascular in its whole extent, with slight thickening, but without ulceration; mucous membrane of stomach injected like that of the œsophagus, and somewhat thickened, except in its pyloric extremity, where the appearance was natural, or nearly so; the color in the central part of the inflamed gastric membrane was deep red; no thrush was noticed, except on the buccal surface during life; along the great curvature of the stomach were white flakes, resembling those of thrush, but which were found by the microscope to consist mainly of

oil globules and epithelial cells, without the cryptogamic formation; mucous membrane of small intestines healthy in their whole extent, except slightly increased vascularity in a few places in the ileum; mucous membrane of colon much injected throughout, except near the ileo-cæcal valve, where the vascularity was slight; in the transverse and descending colon, the redness was pretty uniform, and the membrane was thickened, but not ulcerated; solitary glands and Peyer's patches somewhat elevated.

The observations of Valleix show how frequently gastritis is associated with severe attacks of thrush. In twenty-three of his cases of the latter disease, in which the condition of the stomach was noted after death, this organ presented inflammatory lesions in seventeen, and in three others appearances which may or may not have been due to inflammation.

SYMPTOMS.—A difficulty exists in isolating and defining the symptoms of gastritis from the fact that it commonly coexists with other inflammation of the digestive tube. Though we may never be able to diagnosticate this affection as certainly as we can croup or pneumonitis, still, there are symptoms which arise directly from the gastritis, and with care we may be able to distinguish them from those symptoms which are due to other pathological states.

If gastritis is acute, pain is present. In the above case from Billard, as well as in a case observed by myself, and related under the head of gelatinous softening, there were frequent cries, and the countenance indicated much suffering, until the stage of collapse. If there is less intensity of inflammation, and the disease is more protracted, as is ordinarily the case, the pain is not so severe, and it may be so slight as not to attract attention. Sometimes there is tenderness, so that pressure upon the epigastric region is badly tolerated. Vomiting is regarded as one of the most constant symptoms. The infant after nursing seems in distress till the milk is returned, but it nurses with avidity in consequence of the thirst, if it is not too exhausted or feeble. The dejections may be quite regular throughout the disease, as in the case from Billard. There is ordinarily, however, diarrhœa from the presence of entero-colitis. The pulse is sometimes accelerated, and sometimes nearly natural. The emaciation in gastritis is rapid, since not only the milk is in great measure vomited, but the digestive function, so far as the stomach is concerned, is seriously impaired. The features become wrinkled and senile, the eyes hollow, the limbs attenuated, and the cranial bones uneven. Death occurs from exhaustion.

ANATOMICAL CHARACTERS.—Simple gastritis may affect the entire mucous surface of the stomach, or be limited to a certain part. The part which is most likely to escape is that towards the pyloric orifice. This portion of the organ is sometimes found in nearly or quite the normal state, while the cardiac half or two-thirds are inflamed. The vascularity of the diseased surface is not uniform. In one place there is simple arborescence; in another intense continuous redness, and between these two extremes are different grades of vascularity. The mucous membrane is somewhat thickened, softened, and the secretion of mucus increased. Extravasation of blood is not infrequent under the mucous membrane, usually in points, and the mucus may be mixed with more or less blood. Small shreds or portions of coagulated milk are often found with the mucus attached to the gastric surface. I have observed, though rarely, small superficial ulcers at the point where the inflammation had been most intense.

Diagnosis.—In protracted cases, when entero-colitis is present, it is difficult to make a positive diagnosis. Our opinion must then be little more than a plausible conjecture. In the acute attacks we can diagnosticate the gastritis with more certainty. If a young infant affected with thrush is seized with pain, and it vomits often; if emaciation is rapid, and there is no diarrhœa, or diarrhœa not sufficient to account for the prostration; if the buccal mucous membrane, dotted with the points of thrush, presents a dry appearance and the deep red color of severe stomatitis, there can be little doubt of the presence of gastritis. The diagnosis is rendered more certain by signs of tenderness, when pressure is made upon the epigastric region.

Prognosis.—Like other inflammations, gastritis is probably sometimes so mild that it does not materially increase the suffering or danger of the child. This mild form of the disease under favorable circumstances soon subsides. In other cases, by the continuance or increase of the cause, the inflammatory process becomes more severe and extensive, resulting even in disintegration of the mucous membrane. Those cases are especially severe and likely to terminate fatally, which are protracted and accompanied by severe thrush, with a desiccated appearance of the mouth, or with entero-colitis. Pain, vomiting, and rapid emaciation in such children indicate the speedy approach of death. Improvement in the stomatitis or entero-colitis is a favorable indication, but these inflammations may improve without corresponding improvement in the gastritis.

Treatment.—All food or drinks, except those of a bland and unirritating nature, should be forbidden. If practicable, the young infant should take no nutriment except the mother's milk or that of a wet-nurse. As there is an excess of acid in inflammation of the mucous coat of the digestive tube, lime-water may be advantageously given in combination with the breast milk. Opium is required to relieve the pain and quiet the action of the stomach. The camphorated tincture of opium, in doses of four or five drops to a child a month old, or the syrup of poppy, tincture of opium, or liquor opii compositus, in proportionate doses, may be administered. If there is thirst, a little gum-water should be given frequently. If there is much emaciation and the vital powers are failing, it will be necessary to resort to the use of stimulants. Stimulating enemata are preferable to stimulants given by the mouth. Much benefit may be anticipated from local measures. Irritation should be produced upon the epigastrium by mustard or other means, followed by fomentations. It is rarely, perhaps never, proper to use leeches, if the patient be a young infant. Death occurs from exhaustion, and it is, therefore, important that the vital powers should not be reduced. If the child is weaned, the diet at first should be restricted to arrowroot, rice-water, barley-water, or similar bland substances. In advanced stages of gastritis, animal broths and jellies may be required.

Follicular Gastritis—Diphtheritic Gastritis.

The pathological character of *follicular* gastritis is similar to that of follicular stomatitis. It is an inflammation affecting the gastric follicles and ending in their ulceration. It is not a frequent disease; it occurs in young infants. Billard observed fifteen cases. The symptoms in these patients were similar to those in simple gastritis of a severe form. The emaciation and prostration were rapid, and death occurred early. We can only diagnosticate the gastritis without determining its follicular character. How many recover it is impossible to ascertain, but the disease is apt to be fatal on account of the intensity of the inflammation, not only of the follicles but of the intervening mucous membrane. The treatment is that of gastritis.

DIPHTHERITIC gastritis is infrequent. It occasionally occurs during epidemics of diphtheria. Allusion is elsewhere made to a case treated in the Nursery and Child's Hospital of this city, in December, 1859. The patient, eighteen months old, previously had had protracted entero-colitis, and died exhausted after a brief attack of diphtheria. There were lesions referable to the entero-colitis, and the body was much emaciated. The diphtheritic exudation was found covering the fauces, epiglottis, glottis, to the rima glottidis, the entire œsophagus, and almost the entire stomach. The mucous surface underneath was injected; that of the œsophagus and stomach especially was very vascular, softened and thickened, and the submucous connective tissue was infiltrated.

The pseudo-membrane, taken from the epiglottis and examined under the microscope, presented an amorphous appearance: no cells were noticed in it, and fibrillation was not distinct; that from the stomach was found to consist almost entirely of cells, the plastic corpuscles of some writers, the pyoid of others. The digestive process, so far as the stomach was concerned, had evidently been almost if not entirely suspended, and hence in part the sudden prostration. Diphtheritic gastritis is but a local manifestation of a grave constitutional disease.

Post-Mortem Digestion, Softening.

It is now many years since the attention of the profession was directed to disorganization of the coats of the stomach, which is sometimes observed at post-mortem examinations. John Hunter first ascertained that the gastric juice begins to have a solvent effect on the tissues of the stomach soon after death. Though Hunter erred, when he stated that the coats of the stomach are more or less digested in all or nearly all cases, it is certain that post-mortem digestion does take place in many cadavers, so that a few hours after death the gastric mucous membrane is destroyed to a greater or less extent, and occasionally the stomach is perforated or is even severed from its connection with the œsophagus. I have seen several examples of this post-mortem perforation in infants.

Some of the cases of supposed pathological softening of the stomach reported by the older observers, seem to have been such as I have described, namely, cadaveric. Yet there are two other kinds of softening occurring in children, which are strictly pathological, the one designated white, the other, by Cruveilhier, gelatinous.

WHITE softening of the gastro-intestinal mucous membrane results from deficient alimentation. It has been observed only in anæmic and ill-nourished children. The mucous membrane in such loses its firmness, and is easily separated from the subjacent tissue. This disorganization has no connection with any inflammatory process. It is simply a disintegration of the mucous membrane in consequence of the low vitality of the patient, whether or not there are co-operating causes. I believe that, in a large proportion of infants whose systems have been reduced and blood impoverished for a considerable time, the gastro-intestinal mucous membrane will be found after death less firm and resisting than in those who have been habitually robust.

A vague opinion exists in the minds of most physicians as to the nature and even appearance of the so-called *gelatinous* softening of the stomach, and the following observations will be cited in order to give a clearer idea of it.

Billard has recorded two cases with his usual minuteness, and adds: "What inference shall be drawn from the preceding facts and considerations? None other than that the gelatinous softening of the stomach consists in a disorganization of the mucous membrane of this viscus, caused by an acute or chronic phlegmasia; that this disorganization is characterized by an accumulation of serum in the walls of this organ; the intumescence and gelatinous consistence of the mucous membrane in a part usually circumscribed, situated more frequently in the greater curvature, and about which the membrane exhibits more or less evident traces of an acute or chronic phlegmasia. . . . The softening now under consideration must not be confounded with another kind of softening" (white) "which does not usually succeed an acute phlegmasia."

Billard believes that, while gelatinous softening results from inflammation of the mucous membrane, its proximate cause is an afflux of serum to the part in which the disorganization occurs. In one of the two cases which he reports, he thinks that the inflammation was acute, but in the other chronic, and, therefore, presenting less vascularity.

West, in speaking of gelatinous softening, says: "Softening of the stomach varies in degree from a slight diminution in the consistence of the mucous membrane, to a state of complete diffluence of all the tissues of the organ. . . . When the change is not far advanced, the exterior of the stomach presents a perfectly natural appearance, but on laying it open a colorless or slightly brownish tenacious mucus, like the mucilage of quince-seeds, is found closely adhering to its interior, over a more or less considerable space at the great end of this organ."

Cruveilhier says: "This softening often proceeds from the interior towards the exterior. There is at the beginning simple separation of the fibres by a gelatinous mucus, and in consequence the parietes are thickened and semi-transparent. . . . If the transformation be complete, the disorganized portions are removed layer after layer, those which remain becoming gradually thinner. The peritoneum alone resists for some time, but at length it is attacked, worn, and gives way, and perforation of the stomach results. The parts thus transformed are colorless, transparent, apparently inorganic, completely deprived of vessels, and exhaling an odor resembling that of milk."

Bouchut remarks: "Softening of the mucous membrane of the stomach in children at the breast is not a special disease which it is necessary to describe by itself. This alteration is always connected with other diseases, and is especially with disease of the large intestine, the knowledge of which fact has been too long neglected. It is the consequence of the acidity of the liquids contained in the digestive tube of young children, liquids which are very acid in the disease we have above referred to."

Dr. Carswell states that there is a pathological softening of the mucous membrane of the stomach, and that when it occurs the symptoms may be those of gastritis or enteritis.

Rokitansky says of this form of softening: "If we consider, in addition to the above remarks, the uniform localization of the disease, that in none of its stages it presents, either at the point of the softening or in its vicinity, hyperæmic injection or reddening, and that we are still less able to demonstrate upon the inner surface of the stomach or in the tissue of its coats the products of inflammation, we are constrained to infer the non-inflammatory nature of the affection."

Without extending these extracts, it is seen that eminent authorities not only disagree in reference to the cause of gelatinous softening of the stomach, but that they also differ in their description of its appearance. This diversity of opinion is most likely attributable to the fact that the two kinds of softening have been confounded. Rokitansky and Bouchut probably refer to cases of white softening, which occurs in atonic state of the tissues in feeble infants, and, therefore, have concluded that softening of the stomach is not inflammatory. I believe, from my observations, that the opinion of Billard is correct, and that true gelatinous softening is the result of gastric inflammation, sometimes chronic, sometimes acute. But I have seen appearances which led me to think that the immediate causes of the softening continue to operate after death, so that its amount is less at the time of death than a few hours subsequently.

The following case, which was watched by myself with great interest from beginning to end, is an example of inflammatory softening:—

Case.—G. S., male, robust, was born July 10th, 1865. The mother not being able to suckle the infant, and the danger of artificial feeding in the warm months being well understood, a wet-nurse was procured. About the 14th of July, this wet-nurse having insufficient milk, another was procured temporarily, who suckled the infant till July 20th, when a third wet-nurse was engaged, whose child, healthy and thriving, was six weeks old. Previously to this time the infant appeared well. It had uniformly nursed vigorously and seemed satisfied.

On the 22d of July, thrush, apparently mild, was observed in the mouth, and a powder, supposed to be borax, and labelled such, was obtained at a drug store, to be used as a wash for the mouth. This powder was afterward ascertained to be alum. About five grains were dissolved in as many teaspoonfuls of water, and the mouth of the child was swabbed occasionally with it. A piece of linen, folded so as to resemble the tip of a nursing bottle, was occasionally dipped into the solution, and the infant was allowed to suck it. The use of the alum was commenced about 6 P.M. In the first part of the evening the infant slept considerably, and of course did not nurse often, but about 8 P.M. it began to be very fretful, and it then nursed more frequently. It vomited once between 8 and 10 o'clock P.M. In order to quiet the infant, the tip soaked in the solution was often applied to the mouth, but there was scarcely any intermission in its crying. Through the night it vomited again once or twice, and about the middle of the night had one free liquid stool, which was passed with much tenesmus. The countenance of the infant was indicative of suffering, and its thighs were repeatedly flexed over the abdomen, as if that were the seat of its distress. Paregoric in two-drop doses was several times given through the night, and flannel soaked with hot whiskey was applied to the abdomen.

July 23d. In ignorance of the cause of the child's sickness, another wet-nurse was obtained early in the morning, and one-sixth of a drop of liq. opii compos. was given every hour, with the effect of inducing a little sleep. The tongue was very red, desiccated, and studded with more numerous points of thrush than on the previous day. It now refused to nurse, apparently from soreness of the tongue. At each attempt of the nurse to induce it to take the nipple, it rubbed the mouth across the breast, crying either from pain or disappointment. The alum was not used in the latter part of the night of the 22d, but late in the morning of the 23d it was resumed, the mistake of the druggist not being discovered till midday, when it was estimated that about five grains had been used. Occasionally a little of the solution was placed in the mouth with a spoon so as to be swallowed, in the belief that the thrush affected the œsophagus. The infant continued to suffer much during the day, sleeping at times a few minutes. Its strength was evidently failing; its respiration regular; pulse about 140; its alvine discharges yellow, of natural consistence and frequency.

Evening, 23d. Surface hot; is very restless; pulse 150 to 160; tongue dry, intensely red, and dotted with points of thrush. Is treated with opiates, a little lime-water, and fomentations.

24th. In the first part of the day, nursed pretty well; in the latter part, could be induced to draw the breast only once or twice. The symptoms to-day were the same as yesterday, with the exception of greater emaciation and prostration; cranial bones uneven, and features pinched.

25th. Pulse 140 to 148; strength rapidly failing, but it cries at times loudly. The milk of the nurse, placed in the mouth with a spoon, is often held a considerable time before it is swallowed, and deglutition seems difficult. Respiration in the first part of the day and previously, natural; in the latter part of the day, accelerated; dejections natural; no vomiting; appearance of tongue more natural than yesterday.

26th. Died to-day in a state of collapse at 12½ P.M. The hands were cold several hours before death, and the milk given it was regurgitated.

Autopsy twenty-two hours after death.—Much emaciation; no rigor mortis; cranial bones uneven; upper part of the pharynx injected to the extent of about half an inch; but from this point to the stomach membrane healthy; mucous membrane covering the cardiac two-thirds of the stomach disintegrated, almost diffluent, and in places detached from the subjacent tissue; mucous coat of the pyloric third of the organ nearly healthy; along the edge of the softened portion the mucous membrane was vascular to the extent of a few lines; the muscular and serous coats of the stomach underneath the softened portion were easily torn; the mucous membrane of the small intestine presented in places that degree of vascularity known as arborescence; there was no destruction or softening of its mucous membrane; the colon was healthy; the stomach was nearly empty; the contents of the small and large intestines were natural in color and consistence; the other viscera were healthy; in the left pleural cavity was about an ounce of transparent serum, and a less quantity in the right cavity.

It cannot be doubted that the softening in the above case was pathological. The weather at the time was warm, but the infant was placed on ice, and a pan containing ice was kept upon the abdomen. This infant died evidently of gastritis, the accompanying inflammation being subordinate, and in fact insignificant. At first it was a question with me, whether the alum might not have caused the gastritis, so that the case should be properly placed in the category of deaths from swallowing corrosive substances. In order to determine this point, I administered alum daily to two kittens, commencing when they were seven days old. The quantity given to each was ten grains daily in two doses for three consecutive days, and on the two following days five grains. The only uniform result noticed was an increased flow of saliva, which washed some of the alum from their mouths, and occasionally slight vomiting. There was not even any apparent inflammation of the buccal membrane from the alum.

Post-mortem appearances as in the above case, and similar ones are recorded by Valleix and others, in which gelatinous softening coexisted with evident lesions of gastritis, render it highly probable if indeed they do not demonstrate, that the softening is a result of the inflammation at the point where it occurs.

In Valleix's twenty-four cases of what he terms fatal muguet, softening of the mucous membrane of the stomach was one of the most common lesions, and at the same time, which is the point of interest, there were signs which showed conclusively the presence of gastric inflammation. The common coexistence of the lesions of gastric inflammation, such as redness and thickening, with gelatinous softening of the stomach is certainly most reasonably explained on the supposition that the one results from the other.

I am not prepared to accept nor reject the theory of Billard, that the immediate cause of the softening is the afflux of serum, nor that of Bouchut, that it is an excess of acid.

It has been said that M. Baron was able to diagnosticate gelatinous softening. The symptoms are those of the severer forms of gastritis. The vomiting, great pain, restlessness, sudden and progressive emaciation, and, finally, collapse preceding the fatal result, are the symptoms on which the diagnosis is based. The treatment should be directed to the gastritis.

CHAPTER VII.

DIARRHŒA.

DIARRHŒA is frequent during the whole period of infancy. The French writers describe several varieties according to the character of the evacuations, as acescent, mucous, and serous. M. Rostan even describes fourteen distinct kinds. But the tendency of medical science in these modern times is to simplify the nomenclature of diseases—to describe under a single name those affections which are essentially the same though differing somewhat in their features. Now, all the forms of diarrhœa in the infant may be so grouped as to reduce the number to not more than three or four. In this way repetition and prolixity are avoided, as well as an unnecessary refinement.

Non-Inflammatory Diarrhœa.

The most common and the simplest form of diarrhœa is that enunciated in our heading. Though attended often by an anatomical alteration in the intestines, the inflammatory character is absent. This disease is described by some writers as simple, or catarrrhal, or spasmodic diarrhœa. Many cases of diarrhœa supposed to be non-inflammatory are really cases of entero-colitis, and very frequently diarrhœa not inflammatory in its commencement changes its character and becomes such. This is especially true of such diarrhœal affections as are produced by improper diet.

CAUSES.—The causes of non-inflammatory diarrhœa are various. Influences, which in the adult would have no appreciable effect, increase the number of evacuations in the infant.

A common cause is food of unsuitable quality or quantity. Food that does not digest well is apt to stimulate the intestinal follicles to excessive secretion and accelerate the peristaltic action of the intestines. In infants diarrhœa is sometimes due to too frequent feeding. Many whose stomachs are overloaded obtain relief by vomiting, but others do not. The food not needed for nutrition serves as an irritant, and produces green and unhealthy evacuations. Dr. James Jackson, in his letters to a young physician, calls attention to this cause of diarrhœa.

The mother's milk or the milk of the wet-nurse may disagree, either from some temporary derangement of her system, or continued ill-health, or from causes which are not understood. Non-inflammatory diarrhœa in the nursling is the immediate result, but inflammation may afterwards occur. The milk in these cases frequently contains the elements of colostrum.

Fright or strong mental impressions will also in some children increase the number of evacuations. This cause being transient, the diarrhœa soon subsides.

Another cause is exposure to cold. Children who are insufficiently clothed in the winter season, who are taken from a heated room into a cool one without sufficient precaution, or who lie uncovered at night, are very subject to diarrhœal attacks from the impression of cold on the system.

The cause of non-inflammatory diarrhœa may exist in the child itself. In some children the evolution of the teeth is attended by a relaxed state of the bowels, which ceases when the gum is pierced. Worms in the intestines may also operate as a cause. Diarrhœa is occasionally salutary within certain limits, and of course it is not strictly correct to call it a disease when it is a means of relief. If occurring from an excess of food or from dentition, it may prevent convulsive seizures.

SYMPTOMS.—Non-inflammatory diarrhœa may come on suddenly; but at other times there are precursory symptoms continuing for some days. Whether or not there are antecedent symptoms depends chiefly on the cause. If diarrhœa occur from fright, or from cold, or from improper aliment, it commonly occurs immediately. If from painful dentition, there are previous symptoms referable to the eruption of the teeth.

The prodromic symptoms are restlessness and disturbed sleep; sometimes the physiognomy indicates transient abdominal pains. Indigestion, characterized by regurgitation, nausea, or even vomiting, is an occasional premonitory condition. Finally, diarrhœa commences. The evacuations differ much in color and consistence in different cases, and perhaps at different periods in the same case. In infants they are apt to be green. This color, which is a source of anxiety to the inexperienced, and especially to the parents, is often produced by trivial causes. Slight indigestion will produce it. So will excess of food, even the most bland and unirritating. Occasionally the stools consist in part of undigested portions of food, especially the casein. In children advanced beyond the period of first dentition the evacuations do not differ materially in appearance from those occurring in the adult. The stools are usually passed easily, but there is sometimes in infants more or less tenesmus, if they are acid or in any way irritating. Occasionally there is a sensation of fulness in the abdomen.

In the form of diarrhœa which has been designated acescent, not only is there an acid odor and reaction of the matter vomited, but also of the stools. At night, since less nutriment is taken, and the patient is more quiet, the evacuations in non-inflammatory diarrhœa are less frequent than in the daytime. If the complaint is slight, there is little desire for drink, but if the stools are frequent and thin, especially if they approach the serous character, thirst is often intense; the appetite varies; the tongue is moist, and covered with a light fur; there is often more or less meteorism, but no abdominal tenderness.

The face in this disease is pale. In a few days if the evacuations continue, there is evident loss of weight and flesh. The rotundity of the limbs is gradually lost, and the tissues become soft and flabby. But in most cases, when the affection has reached this stage, its original character is lost, and it has become inflammatory.

There is no constant fever in true non-inflammatory diarrhœa.

Sometimes the pulse is accelerated in the latter part of the day, but usually only for a short time.

Certain epiphenomena, as Barrier terms them, occur at times in non-inflammatory as well as in inflammatory diarrhœa, for example a sympathetic cough, or, which is more serious, cerebral complications. Convulsions or stupor, indicating the supervention of spurious hydrocephalus, may occur in either form of diarrhœa. This disease is described elsewhere.

Anatomical Characters.—The structural changes observed in the intestines in those who die of non-inflammatory diarrhœa have been well described by Billard. "I have seen," says he, "isolated follicles, and follicular plexuses of the intestinal tube, in considerable numbers, and developed without being inflamed, in twelve infants. There were three aged from eight days to three weeks; two aged two months; the remaining seven were from nine months to one year. The follicles appear at the commencement of dentition. Ten of these children were affected with diarrhœa of liquid, white, mucous matters. This is really the serous diarrhœa of authors; and every symptom leads to the belief that there is a direct relation between the development of these follicles and the augmentation of their secretion." . . . "I do not consider this morbid development of the muciparous follicles as a true inflammation. Nevertheless, this state of excitability which causes the augmentation of their secretion is, as it were, an intermediate stage between the normal state and the state of inflammation." Barrier's views also coincide, in the main, with those of Billard.

One of the most common lesions observed in the intestines, in those who have died with non-inflammatory diarrhœa, is, as these authors remark, turgescence of the intestinal glands. In a large proportion of cases these glands will be found more distinct than in the healthy state.

The solitary follicles of the large intestines, especially, are, in most cases, elevated, and their central depression distinct; the patches of Peyer are also prominent.

The following is an example of non-inflammatory diarrhœa in a young infant:—

On the 7th of July, 1865, a foundling, one month old, died at the Infant Asylum. It was much emaciated, with eyes sunken and features pinched, at the time of its death. It was wet-nursed towards the close of its life, but the nurse's milk was insufficient. It did not vomit; did not have any marked acceleration of pulse (128 per minute), and its evacuations were about four daily, and thin. The stomach and intestines were pale throughout. The solitary glands, particularly those in the colon, and the patches of Peyer, were tumefied so as to be visible, and somewhat raised above the surrounding surface. There was probably slight thickening of the mucous membrane, and tumefaction of the muciparous follicles, but these changes were not clearly ascertained.

DIAGNOSIS.—The only disease with which there is liability of confounding non-inflammatory diarrhœa is enteritis or entero-colitis. From these it may be diagnosticated by the absence of continued fever and of abdominal tenderness. Sometimes, indeed, it is difficult to say whether the case is non-inflammatory or whether there exists a moderate degree of inflammation, though practically the determination of this point is not important.

PROGNOSIS.—In a large proportion of cases, non-inflammatory diarrhœa is not dangerous. With the adoption of suitable measures to remove the cause, and the use of medicines to control the discharges, the patient recovers. The remark already made may be repeated here, that occasionally diarrhœa is salutary within certain limits, as when there is a foreign substance in the intestines, either irritating mechanically or by its chemical properties, and which the diarrhœa serves to remove.

The danger, in non-inflammatory diarrhœa, arises from complications, as spurious hydrocephalus, or from the emaciation and exhaustion. There may also be danger of its eventuating in inflammation, which is always serious. Whether or not the diarrhœa is in itself injurious to the child, and a source of danger, may be determined by observing whether or not there is emaciation.

If the rotundity of the figure and firmness of the tissues are preserved, showing that alimentation is still sufficient, and no complication arises, the diarrhœa is not as a rule injurious. In infants that over-nurse and do not vomit the surplus milk, the evacuations are sometimes green and frequent, and yet fulness of figure is preserved, and the development of the body proceeds as usual. The same state is sometimes observed in the diarrhœa accompanying dentition. In these instances a moderately relaxed state of the bowels is not injurious. On the other hand, diarrhœa attended by emaciation or softness or flabbiness of the flesh requires immediate treatment. Many lives are lost by the neglect of such patients till they are so reduced that they can no longer derive any material benefit from remedial measures. This fatal neglect is common during the process of dentition.

TREATMENT.—It is necessary, in order to treat successfully diarrhœa in infancy and childhood, to ascertain the cause, and, so far as possible, to remove it. It is not till the cause ceases to operate, that we can expect a satisfactory result from medication. The disease may be temporarily relieved by medicine, but it usually returns at once when treatment is omitted, unless the patient is removed from the influence of the agencies which produce it. These remarks are especially applicable to the diarrhœa of infants. With them very generally, when affected with this complaint, there is some fault as regards the quantity or quality of food. Attention to this matter will show the need of a change of wet-nurse, or, if the infant be spoon-fed, a change in the character of its food or the mode of preparation or even in the quantity given. In many cases, by change in the diet, and the adoption of hygienic measures, the complaint ceases, so as to require no medication. If medicines are needed, and the symptoms are not urgent, it is occasionally advantageous to commence treatment by the use of some of the milder purgatives in small doses. In the *infant*, in whom the dejections are so generally acid, an alkaline laxative, or a laxative conjoined with an alkali, often has a good effect as preliminary treatment. Half a teaspoonful to one teaspoonful of castor oil, or a proportionate dose of Rochelle salts, removes any acid or irritating substance from the intestines, and is followed by a diminution in the number of stools. The improvement, however, without subsequent treatment, is usually only for a day or two. The use of a purgative should, therefore, be considered as preliminary to other measures. In this city a purgative dose of castor oil is often given as a domestic remedy in infantile diarrhœa, the beneficial effect from it having popularized its use for this purpose. Trousseau usually gave Rochelle salts.

If there has been previous constipation, and the diarrhœa has just commenced, a purgative is obviously indicated. With the operation of this medicine there is frequently marked improvement. West says: "Provided there be neither much pain nor much tenesmus, and the evacuations, though watery, are fæcal, and contain little mucus and no blood, very small doses of the sulphate of magnesia and tincture of rhubarb have seemed to me more useful than any other remedy:—

℞. Magnesiæ sulphatis ʒj;
Tinct. rhei ʒss;
Syr. zingiberis ℥j;
Aquæ carui ʒix. Misce.
ʒj ter die for children one year old;

and I seldom fail to observe from it a speedy diminution in the frequency of the action of the bowels, and a return of the natural character of the evacuations."

In diarrhœa of infants, due to indigestion, and attended by acidity, the following prescription is sometimes useful. By improving digestion and correcting acidity, it has a beneficial effect on the diarrhœa. The cases are, however, in my experience exceptional in which this is the proper remedy.

℞. Pulv. ipecacuanhæ gr. j;
Pulv. rhei gr. ij;
Sodæ bicarb. gr. iv–vij. Misce.

Divide in chart. No. xij. One powder every four to six hours to an infant one year old.

The effect of laxative medicines employed for the purpose of correcting the functions of the gastro-intestinal surface is uncertain. If there is no improvement from their use within two or three days, they should be omitted. We must rely on astringents, opiates, and, in infants, also on alkalies. If the symptoms are urgent, if the evacuations are frequent and exhaustive, these agents should be employed from the first. Much harm is often done, and precious time lost, by prescribing laxative mixtures when opiates and astringents are required. I have known them to aggravate the complaint, when, by change of measures, there was immediate improvement. The majority of cases of non-inflammatory diarrhœa, at the period when the physician is called, are best treated by the use of astringents and opiates exclusively, proper directions at the same time being given in reference to the diet and hygienic management.

In the diarrhœa of infants the compound powder of chalk and opium is an excellent medicine, containing, as it does, an astringent with the opiate and alkali. It may be given, in doses of three grains, to a child one year old, every three hours. I ordinarily employ it with double its quantity of subnitrate of bismuth, and know no better remedy for ordinary cases. The following is also an old but useful prescription in the simple diarrhœa of infants:—

℞. Tinct. opii camphorat.,
Tinct. catechu, āā ʒij;
Mistur. cretæ ℥j. Misce.

Dose, one teaspoonful every two to four hours to a child one year old.

If there is no acidity of the evacuation, the following mixture will often be found effectual, which is similar to one recommended by Dr. West:—

℞. Acid. tannic. gr. xij;
Tinct. opii gtt. xij;
Tinct. cinnamom. comp. ʒij;
Sacch. alb. ℥ss;
Aq. cinnamom. ʒx. Misce.

Dose, one teaspoonful every two or three hours, or longer time, according to the evacuations.

Kino, krameria, or logwood may be used in place of the astringents mentioned above. If the diarrhœa is due to the feeble digestive powers of the patient, and its food is therefore irritating, powders of pepsin and subnitrate of bismuth may be employed.

In the treatment of non-inflammatory diarrhœa occurring in infancy, it is rarely necessary to use the mineral astringents, as acetate of lead or nitrate of silver. If the patient is not relieved by opiates, alkalies, and the vegetable astringents, and by proper regimen, in all probability there is inflammation of the intestinal mucous membrane. In patients over the age of two or three years, simple diarrhœa approaches in character that of the adult, and the treatment appropriate for the adult is proper in these cases, allowance being made for the difference of age. In infants, in whom this disease, if protracted, is very liable to eventuate in spurious hydrocephalus, stimulants are often required at an early period, on account of the prostration and feeble power of endurance.

CHAPTER VIII.

INTESTINAL INFLAMMATION OF INFANCY.

It is customary with writers to treat of inflammation of the small and large intestines in infancy as a single disease, for the following reasons: First, the symptoms of colitis, at this period of life, do not ordinarily differ, in any marked degree, from those of enteritis. The tormina, tenesmus, and abdominal tenderness, which characterize colitis in childhood and adult life, are ordinarily lacking, or are not appreciable by the observer; and the muco-sanguineous evacuations are oftener absent than present. On account of this absence of symptoms, Bouchut says: "Dysentery is a very rare disease amongst young children. Its existence might even be denied, if it had not been observed at the period of some severe epidemics of dysentery." If Bouchut refers, by the term dysentery, to the ordinary phenomena of that disease, his remark is correct; but, as regards the lesions, it is erroneous, for colitis is not so rare in infancy as his remark implies. Billard, after analyzing eighty cases of intestinal inflammation in infants, says: "From this calculation, it is evidently very difficult to make a correct diagnosis of inflammation of the intestinal tube in sucking infants, yet it would seem as if the proper signs of enteritis or ileitis were the rapid tympanitis of the abdomen, the diarrhœa, accompanied with vomiting; while in colitis, diarrhœa alone, without tympanitis, is the most frequent." And again: "In consequence of the impossibility we have found to exist of tracing with exactitude the series of symptoms proper to inflammation of the different portions of the digestive tube, we shall content ourselves with presenting an analytical sketch of the causes, symptoms, and ordinary course of inflammation of the mucous membrane of the intestines in general."

The frequent absence of any pathognomonic symptom or sign, by which to determine the exact seat of intestinal inflammation in the infant, is admitted by recent observers as well as Billard.

The second reason why intestinal inflammation in the infant is described as a single disease is, that enteritis and colitis are in the majority of cases coexistent. This will be seen when we come to speak of the anatomical characters.

I have hesitated in selecting a term for this inflammation. The expression inflammatory diarrhœa, used by West, is objectionable, because it designates a disease by a symptom when there are well-marked lesions. To the expression entero-colitis, employed by Bouchut, Meigs, and others, there is this objection, that sometimes the disease is only enteritis, and sometimes colitis; whereas entero-colitis would imply the presence of both inflammation of the small and the large intestines. Barrier uses the expression gastro-intestinal inflammation, but in a large proportion of cases gastric inflammation is absent. I have treated of gastritis as an independent affection, and it seems proper to exclude it from our description of the intestinal disease, except as a complication.

Although I prefer the term intestinal inflammation, I shall use, in describing the disease, the expressions inflammatory diarrhœa and entero-colitis as synonymous, in order to avoid too frequent repetition of words.

Intestinal inflammation is one of the most common and fatal of infantile diseases. It is the great summer epidemic of the cities, in this country. Unfortunately for a correct understanding of its prevalence and mortality in this city and perhaps elsewhere, it is very generally in the summer months when obstinate, and especially when fatal, called cholera infantum, although, in its symptoms and nature, it is very different from that disease.

Intestinal inflammation is often a protracted complaint, having ordinarily a mild commencement, while the true cholera infantum begins abruptly, is characterized by violent symptoms, and rapid and extreme exhaustion. The two diseases are, however, often associated as cause and effect.

The 1500 fatal cases of so-called cholera infantum, reported every summer in this city, are, with now and then an exception, cases of inflammation, generally protracted. In like manner, the excess of reported cases of infantile marasmus, in the second half of the year, over those reported in the first half, should be added to the statistics of intestinal inflammation. This excess, which is noticed every year in the mortuary tables of this city, is due mainly to the death of those wasted infants who have lingered with entero-colitis from the summer months. Their marasmus is simply a result of the protracted inflammation.

CAUSES.—Inflammatory disease of the intestines in infancy, I have said, is chiefly a summer affection—at least, in the cities. Occasionally it is observed in the winter, and it is then, when not due to error of diet, produced by exposure to cold. Infants who are taken from warm to cold rooms, or into the open air, by heedless nurses, or who sleep uncovered at night, are especially liable to this disease. Entero-colitis produced by this cause occurs both in the country and city.

In these cases the inflammatory process may not commence suddenly. There is often a premonitory stage of simple diarrhœa, the first effect of the impression of cold. Indeed, in a very large proportion of cases, whatever the cause, non-inflammatory precedes inflammatory diarrhœa.

The influence of the summer season in the production of this disease is forcibly shown by the death statistics of this city. Thus, for the five years ending with 1863, there were 6379 deaths reported from cholera infantum, and of these all but 166 occurred in the months from June to October inclusive. The deaths reported for the same years from diarrhœa, dysentery, and inflammation of the bowels, were 5914, of which 3919 occurred in the months from June to October. Of the 5914, the number under the age of five years was 3257.

Those familiar with the diseases of this city, and especially with the autopsies of infants, will agree that four-fifths of the above cases which were reported as cholera infantum or diarrhœa were cases of intestinal inflammation. There is no one disease, except consumption, so prevalent and fatal in this city as infantile entero-colitis during the period of its epidemic occurrence in the summer months.

The epidemic commences about the middle of May. From this time there is a gradual increase in the number affected, till the months of July and August, when the disease attains its maximum prevalence and mortality. During the months of September and October, the number of seizures and of deaths gradually abates till the epidemic character is lost. It is thus seen that the prevalence of intestinal inflammation of infancy in the city bears a close relation to the degree of summer heat. That the high temperature of summer is not in itself sufficient to produce entero-colitis is, however, obvious. In elevated localities in the country there may be intense and long-continued heat, and yet in such places intestinal inflammation of infants is not common. It is no doubt the noxious exhalations from various sources with which the atmosphere is loaded, as a consequence of the heat, which render the disease so prevalent in certain localities in the summer months. The exact character of these exhalations or vapors is not fully known, but the following facts are clearly established by many observations.

Entero-colitis prevails most on low grounds near the sea-shore. Thus, it is common in many parts of Long Island, on Staten Island, and on the flats of Westchester County. Experienced and observing physicians of this city do not send infants affected in the summer months with entero-colitis to these localities, but to the high grounds west of the Hudson, and to the hilly parts of New Jersey, where there is comparative immunity from the disease, and recovery is more certain and speedy.

But the state of atmosphere which is most favorable for the development of entero-colitis is found only in the cities. The filthy streets containing more or less decaying animal and vegetable matter, the crowded and unclean tenement houses, the neglected privies, the slaughter houses, pig-pens, bone-boiling establishments, and the like, are so many sources of the most deleterious effluvia, which, inspired by the infant, produce diarrhœa and intestinal inflammation. Those squares of the city where sanitary regulations are most neglected are the very ones where the mortality from this cause is largest.

In the year 1864 the Citizens' Association of the City of New York effected a complete and thorough sanitary inspection of New York island, and it was interesting as well as painful to note the facts observed by the inspectors in reference to the prevalence of the so-called cholera infantum (chiefly entero-colitis) along the streets and in the alleys where the causes of insalubrity were most abundant.

Thus, one inspector says, of this disease, it "has probably consigned many more to the grave during the past summer than all other diseases in my inspection district. In every case examined, I have found it associated with some well-marked source of insalubrity. Vegetable and animal decomposition has been the most prominent cause." Another inspector says of the same disease: "It was found between the —— and —— avenues, where the street, at every visit, was found in an indescribably filthy state, in consequence of deposits of garbage and slops. This was particularly noticed in front of the premises where cholera infantum had occurred." Such was the uniform testimony of all the inspectors. In the tenement houses and in portions of the city occupied by the poor, where the sources of insalubrity are most numerous, I believe, from personal observation, that a majority of the infants are more or less affected with diarrhœa, often of an inflammatory character, during the months of July, August, and September. In the more salubrious localities of the city, there is less of this disease, but even here the liability to it is great, on account of the proximity of so many sources of impure air.

But there is another and an important element in the causation of intestinal inflammation in the infant. I refer to the diet. Many an infant that now falls a victim would escape the disease, but for some fault in the character of its food. Those infants in the city who are bottle-fed from birth rarely go through the summer without being affected with diarrhœa, and a majority of such, if under the age of six months, when the warm weather commences, are saved from dangerous if not fatal inflammation only by removal to the pure air of the country.

In the families of the poor the food which is given as a substitute for the mother's milk is very apt to disagree with the feeble digestive powers of the infant. The swill milk, about which so much has been said and written, is in common use in this city among these people, or has been till recently. This milk, in the proportion of its ingredients, and sometimes even in its chemical character, is very different from the milk of healthy and well-fed cows of the country. Infants to whom this milk and other improper articles of diet are given are the first to suffer with diarrhœa as warm weather commences, and finally with entero-colitis.

It is seen that the causes of intestinal inflammation of infancy as it prevails in the cities during the summer are mainly twofold, atmospheric and dietetic—an insalubrious state of the air which the infant breathes, and unsuitable food. Among the poor of the cities, both these causes conspire to produce the diarrhœal maladies. It is easy, then, to see why there is so much intestinal disease and so great mortality among the infants of the city poor. Moreover, on account of their feeble powers of resistance and endurance they are especially liable to be affected by morbific agencies.

It is a common belief in the profession that dentition is one of the chief causes of diarrhœa in the infant, whether inflammatory or non-inflammatory.

There is, indeed, great liability to this disease during the period of dental evolution. The following statistics, which were mostly collected during my term of service in one of the city dispensaries, and which comprise all the cases of diarrhœa under the age of about five years which were brought into that institution for treatment during the summer months of my attendance, show the preponderance of cases in the time of teething. Most of these cases were apparently inflammatory.

Stage of Dentition.	No. of Cases.
No teeth	47
Cutting incisors	106
" anterior molars	41
" canines	40
" last molars	20
Having all the teeth	28
Total	282

It is seen that although a large majority of the above cases occurred during dental evolution, yet in a certain proportion, about one in four, teething could not operate as a cause. My own opinion is that dentition is an occasional cause of simple diarrhœa though a subordinate one, but evidence is wanting that it is sufficient of itself to produce inflammation. The diarrhœa of dentition is probably non-inflammatory, terminating in inflammation, if such a result follow by the co-operation of other and distinct causes. This subject is treated of in our remarks relative to dentition.

An important predisposing cause of intestinal inflammation in infants is the rapid development of the intestinal crypts and follicles. This development, which increases the liability to organic diseases of the intestines, is coincident with dentition. Another important cause remains to be noticed, namely, weaning. Weaning is a subject to which less attention is given than its importance demands. The summer succeeding the change of diet is always in the city a time of great danger to the infant from diarrhœal affections. Mothers uniformly speak with dread of the second summer. In this city, nearly every infant taken from the breast between the months of April and October very soon becomes affected with diarrhœa, which, if not inflammatory in its commencement, soon becomes such. Weaning in the cool months involves less danger, but even then the succeeding summer is one of peril. I have memoranda of the time of weaning in forty-six infants who were affected with diarrhœa apparently from its duration and obstinacy of an inflammatory character.

Weaned in spring or summer	35
" " autumn or winter	11
	46

The reader is referred, for other particulars in reference to weaning, to the chapter devoted to this subject.

The above facts and statistics, to which more might be added, suffice to show the causative relation of foul atmosphere and injudicious feeding to the intestinal inflammation of infancy.

Intestinal inflammation also occurs as a complication of certain diseases, especially the eruptive fevers. It is the opinion of some, that in measles and scarlatina there is mild inflammation of the intestinal mucous membrane, coexisting with the eruption upon the skin, and disappearing with it. But in a proportion of cases, most frequently in measles, a more intense inflammation arises, constituting a serious complication. The peculiar intestinal inflammation in typhoid fever is well known.

AGE.—My observations in reference to the age at which this disease occurs were made in the summer months, and, therefore, relate to the summer epidemic. The cases embraced in the following table were nearly all observed between the months of May and October inclusive:—

Age.	No. of Cases.
5 months or under	58
From 5 months to 12	212
" 12 " " 18	174
" 18 " " 24	93
" 24 " " 36	36
Total	576

This table shows that the infant under the age of six months is less liable to entero-colitis than between the ages of six months and two years. The small comparative number, however, affected under the age of six months, I attribute to the fact that most of the infants under this age were wet-nursed. Observations made in the institutions of this city in which foundlings are received show that the younger the infant is, the more liable it is to be affected with this disease, under unfavorable conditions of atmosphere and diet. Thus, in the infant's service of Charity Hospital, prior to the adoption of wet-nursing, a large proportion of the foundlings received died of well-marked entero-colitis in the first and second months, and very few lived till the age of six months. A similar fact was observed in the New York Infant Asylum in Bloomingdale.[1] During my term of service in this institution, I preserved notes of forty-nine fatal cases, which I diagnosticated entero-colitis, and in many of which post-mortem examinations were made. Of these cases, eighteen were one month old or under, fifteen from one month to three, eight from three to six, and only eight over the age of six months.

SYMPTOMS.—Intestinal inflammation in the infant usually commences with moderate diarrhœa. At first there may be no appreciable anatomical alteration of the mucous membrane except simple turgescence of the follicles. The number of evacuations at this period frequently does not exceed four to six daily. The color and consistence of the dejections vary. The color is sometimes yellow at this early stage of the disease, and sometimes green, especially in young infants. Whatever the color or appearance of the stools, there is great uniformity in one respect, and that is their acidity. Litmus paper is reddened by them, and they have a decidedly acid odor. Often there is from the commencement more or less fretfulness and febrile reaction.

In a few days, the disease continuing, the infant, whose stomach was at first retentive, begins to vomit. This symptom I found, from observations made in 1863 and 1864, in the summer entero-colitis of infants, commences in less than a week in the majority of cases, though the time varies greatly. In consequence of the vomiting and diarrhœa, the patient becomes pallid, the flesh soft and flabby, and soon there is evident emaciation. If there is fretfulness in the beginning of the sickness, it now ceases, and the patient lies quiet, having an exhausted appearance. As the disease advances, the features become pinched and wrinkled. The hollowness of the cheeks and sunken state of the eyes are in striking contrast with the appearance presented before the inflammation commenced. So feeble is the muscular tonicity in advanced cases, that the orbicularis oris and orbicularis palpebrarum lose in great part their contractile power, and the mouth and eyes continue open during sleep.

---

[1] This institution was discontinued within a year from its establishment, all connected with it becoming discouraged from the great mortality of the foundlings, who were chiefly bottle-fed.

In the beginning of the disease the tongue is moist and covered with a light fur. At a more advanced stage it is dry, and in dangerous forms of the disease the buccal membrane is red, the gums swollen, and sometimes ulcerated, and in young children thrush is apt to appear.

Vomiting, commencing, as I have said, at a later period than the diarrhœa, continues, unless relieved by medication or a favorable change of the disease. It is sometimes very intractable. It is in most cases associated with an excess of acid in the stomach, and is probably mainly due to this, except at an advanced stage of the inflammation. The substance vomited has a sour odor, and produces a decided reaction with litmus paper. It contains coagulated casein and undigested particles of whatever food has been given. When the vital powers are much reduced and the inflammation is violent or protracted, spurious hydrocephalus is present or threatening, and the vomiting appears then to be due to the cerebral affection.

The stools sometimes continue, during the whole course of the entero-colitis, of nearly the same character as at first. In other cases they vary, at different periods, in color as well as consistence. They sometimes have a putty-like appearance, from the partly digested casein; at other times they are brown and offensive. A very common appearance is that which has been likened to spinach or chopped vegetables; occasionally the stools consist largely of mucus, with perhaps a little blood—the mucous diarrhœa of Barrier. This occurs when colitis is a principal part of the disease. The evacuations are seldom so watery as in true cholera infantum.

Occasionally they are yellow when passed, but become green on exposure to the air, or from chemical reaction resulting from admixture of the urine.

The *microscopic* character of the stools in entero-colitis is interesting. Aside from undigested casein, I have found unaltered fibres of meat, crystalline formations, epithelial cells, single or arranged regularly in clusters, as if detached from the villi, mucus, sometimes blood, and, in one case, an appearance resembling three or four crypts of Lieberkuhn united. If the stools are green, colored masses of various sizes, but mostly small, are also seen with the microscope. The microscopic elements, then, are the excrementitious substances, particles of undigested food, inflammatory products, and epithelial cells or fragments of the mucous membrane, thrown off by the inflammatory process.

The *pulse* in entero-colitis is accelerated. There is frequently increased heat of surface in the commencement, but, as the disease continues, the vital powers soon become reduced, and the surface is either of the natural temperature or cool. As death approaches, the pulse gradually becomes more frequent and feeble, and the extremities, sometimes for hours before life is extinct, have a cadaverous pallor and coldness. The skin, in intestinal inflammation, is generally dry, and the urinary secretion diminished. In severer forms of the disease, attended by frequent evacuations from the bowels, the infant does not pass its urine oftener than once or twice daily. The imperfect action of the skin and kidneys is a noteworthy feature of the inflammation. The advanced stages of entero-colitis are apt to be complicated by two cutaneous affections, namely, erythema between the thighs, probably produced by the acid and irritating character of the stools, and boils upon the forehead and scalp. The latter sometimes extend down to the pericranium, and leave permanent depressed cicatrices. The external irritation caused by the furuncular affection has often seemed to me conservative, as it occurs at the time when there is danger of passive congestion of the brain and serous effusion. When entero-colitis is protracted, and the patient is much reduced, remaining constantly in the recumbent position, except when held in the arms of the mother or nurse, another symptom frequently arises, namely, a dry cough, which continues till the close of life, if the case be fatal, and subsides slowly if the disease terminate favorably. The complication which gives rise to this symptom will be considered hereafter. As death approaches, the infant sometimes becomes more fretful; it turns peevishly from playthings, rolls its head, or the head has an unsteady movement; and sometimes the stomach is more irritable. The experienced physician rightly interprets these symptoms as the forerunner of cerebral accidents. In other cases there is too great prostration even for the exhibition of restlessness, and the infant lies quiet. As death approaches, the infant becomes drowsy. The limbs are cool. It refuses to nurse, or, if spoon-fed, takes nutriment apparently without relish. The pupils are contracted, and insensible to light. The eyes are bleared, and a puriform secretion occasionally collects between the lids. The stools are less frequent, and the vomiting, if previously present, ceases. Death occurs quietly.

Sometimes, however, convulsive movements precede death, generally slight, as of one arm, or of the limbs or one side. Uræmia may be the immediate cause of death in certain cases.

In chronic entero-colitis there is extreme emaciation for a considerable time before death. The skin of the extremities lies in wrinkles; the joints, from contrast, appear enlarged, and the fingers and toes elongated; the angular projections of the bones are prominent. The hollowness of the cheeks and eyes causes the infant to appear much older than it really is. Death occurs in a state of extreme exhaustion.

The above description applies to infantile entero-colitis, as it so frequently occurs in the cities. It is sometimes much more violent, attended by much greater febrile reaction, and is more speedily fatal. Especially is this the case when it is due to the impression of cold: such cases are not infrequent in the winter months, in the country as well as city.

Instead of the mild and gradual commencement which I have described, infantile entero-colitis may be preceded by violent symptoms—a true cholera morbus. Vomiting and purging, more or less severe, precede the inflammation. Among my records are cases which commenced in the summer season from eating gooseberries, currants, cherries, and cheese: the cholera morbus produced by these indigestible substances ending in protracted inflammation.

Cholera infantum, in which the symptoms from the first are violent and alarming—a disease attended by vomiting and frequent watery stools, occasionally ends in the establishment of intestinal inflammation; and, as there are no symptoms by which it is possible to determine precisely when the inflammation begins, it seems as if the inflammation itself had this violent commencement. But the severe choleraic symptoms usually abate before the inflammation is established.

Anatomical Characters.—Billard says: "In eighty cases of inflammation of the intestines that I examined with great care, there were thirty of entero-colitis, thirty-six of enteritis, and fourteen of colitis." M. Legendre, in twenty-eight cases of diarrhœa, found colitis alone in nine, and in the cases in which enteritis occurred colitis was also present. Rilliet and Barthez state, that in certain rare instances almost the entire digestive tube is affected; that in exceptional cases the principal lesion is found in the small intestines, while, on the other hand, the large intestine is the part of the alimentary canal which is most frequently and intensely inflamed. Billard describes four kinds of intestinal phlegmasia: First, erythematic; second, with altered secretion; third, follicular; fourth, with disorganization of tissue. In some of the best works on diseases of children, published subsequently to that of Billard, different forms of inflammation are described, according to the presence or absence of certain anatomical changes, as ulceration or softening. Practically little is gained by such a division of the general disease, and the lesions which are made the basis of the division are often merely the result of severe and protracted, simple or erythematic, inflammation. I have records of the post-mortem appearances in eighty-two cases of intestinal inflammation in the infant. Eleven of these occurred in private or dispensary practice; about fifty in the Nursery and Child's Hospital, and the remainder in the Infant Asylum. Since preserving these records, I have witnessed a larger number of post-mortem examinations of infants who died of this disease in these institutions, and the lesions corresponded in general with those already observed. The question may properly be asked, can inflammatory hyperæmia of the intestinal mucous membrane be distinguished from simple congestion if there is no ulceration and no appreciable thickening of the intestine? This is sometimes difficult, and it is possible that occasionally I have recorded as inflammatory what was simply a congestive lesion, but I do not think that I have incorporated a sufficient number of such cases to vitiate the statistics. In a large proportion of the autopsies there was manifest thickening of the intestinal mucous membrane or other unequivocal evidence of inflammation. The following is an analysis of the eighty-two cases:—

The upper part of the small intestine, embracing the duodenum and jejunum, was found inflamed in twelve cases. It was free from inflammation, and of a pale color, in fifty-one cases. The ileum was inflamed in forty-nine cases, and the cœcal portion, including the ileo-cœcal valve, was the part in which the inflammation was uniformly most intense and to which it was often confined. In sixteen cases there was no ileitis, and in thirteen no enteritis whatever. Therefore, the ileum was inflamed in all but three of the cases of enteritis, in which the records give the exact location of the disease. In fourteen cases there was vascularity in streaks or in patches, or simple arborescence in some part of the small intestines, the records not stating its exact location.

In most cases the inflamed mucous membrane was perceptibly thickened. Occasionally, especially if the vascularity was slight, the thickening was scarcely appreciable. In one case there was so much thickening of the ileum next to the ileo-cœcal valve that the mucous coat appeared as if closely studded with small warts. Ulcers of small size were found in the mucous membrane of the small intestines in five cases. These ulcers in one case were in the jejunum, in two in the ileum, and in two in both these divisions of the intestine. They were for the most part quite superficial, and circular or oval.

It is seen from the above records that the portion of the small intestine most frequently inflamed was the ileum. The inflammation usually affected the ileo-cœcal valve, and extended from it to a greater or less extent along the small intestine. In general, when inflammatory patches were found in different parts of the small intestine, those in the ileum nearest the ileo-cœcal valve presented the greatest vascularity and thickening. Billard noticed in his cases the frequency and intensity of the inflammation in the terminal portion of the ileum, and the consequent thickening of the ileo-cœcal valve, and conjectured that the vomiting so common and obstinate in enteritis might be due to obstruction at the ileo-cœcal orifice in consequence of this thickening. I have often seen the orifice reduced to a very small size from the hyperæmia and thickening of the valve, but have not seen any accumulation above it or other evidence of obstruction.

The inflamed mucous membrane was softened in greater or less degree according to the intensity of the inflammation. Sometimes the vessels of the submucous connective tissue were injected, and this tissue infiltrated. The softening of the mucous coat, and the firmness of its attachment to the parts underneath, varied considerably in different specimens. I was able, in cases in which there was considerable softening, to detach readily the mucous coat with the nail or back of the scalpel, within so short a period after death that it was evident that the change of consistence could not have been cadaveric.

The infants in whom the duodenum and jejunum presented the inflammatory lesions were, with few exceptions, under the age of three months, and in many of these cases there was hyperæmia of the gastric mucous membrane, and in some also stomatitis.

In all the cases except one, namely, in eighty-one, there were lesions indicating inflammation of the mucous membrane of the colon. In thirty-nine, the inflammation had affected nearly or quite the entire extent of this portion of the intestine; in fourteen, it was confined to the descending portion entirely, or almost entirely; in twenty-eight cases, the records state that colitis was present, but its exact location was not mentioned. In eighteen of the examinations, the mucous membrane of the colon was found ulcerated. According to these statistics, there is colitis in nearly every case of intestinal inflammation in infancy, and in a large proportion of cases also ileitis. The portion of the colon which is most frequently inflamed is that in and immediately above the sigmoid flexure. If the colitis affects other portions also, it is nevertheless in this part that we find the most marked inflammatory lesions.

The solitary glands, both of the large and small intestines and Peyer's patches, are involved in nearly all cases of this disease. Even in non-inflammatory diarrhœa they become tumefied, so as to be distinctly visible and somewhat elevated. In entero-colitis, as we have already seen, they present different appearances, according to the degree and duration of the inflammation. In recent cases, and in parts of the intestine where the inflammatory action has been mild, there is often no perceptible change of these glands except slight enlargement with vascularity. This enlargement is most apparent if the intestine is viewed by transmitted light, when not only the glands are seen to be swollen, but their central dark points are also quite distinct. If there is a higher grade of inflammation, or inflammation more protracted, the volume of the solitary follicles is so increased that they rise above the common level and present a papillary appearance. Peyer's patches are in a corresponding degree thickened.

The enlargement of these glands is due to hyperplasia, namely, an augmentation in the number of the elementary cells. The ulceration in the cases which I have examined appeared to be primarily and chiefly follicular. While some of the solitary glands in a specimen were found simply tumefied, others were slightly ulcerated, and others still nearly or quite destroyed. The ulcers were usually from one to three lines in diameter, circular or oval, with edges a little raised, and red. They resembled in appearance the ulcers in follicular stomatitis. In one or two instances I have seen small coagula of blood in the ulcers, and I have also seen ulcers which had evidently been larger, having partially healed. The principal seat of the ulcers was in the descending colon. They were either found in this portion of the intestine only, or, if occurring elsewhere, they were here most abundant.

Those in whom I have found ulcers have been ordinarily over the age of six months, which is the time when there is greatest development and activity of the glandular apparatus. In none of the cases observed by me were Peyer's patches ulcerated, though generally tumefied.

In cases in which the caput coli was inflamed, I have sometimes found the mucous membrane of the appendix vermiformis also injected and thickened. In one case only was there pseudomembrane upon the inflamed surface. This was in the descending colon, and it was thin like a film. The rectum presented no inflammatory or other lesions, or but slight lesions in comparison with those in the colon. Often, when there was almost general colitis, the rectum was found of a pale color, or but slightly vascular. This may explain the rare occurrence of tenesmus in infantile entero-colitis. The amount of mucus secreted from the intestinal surface in this disease is considerably in excess of the normal quantity. It often forms a layer upon the mucous membrane of the intestines, and appears in the stools, mixed with epithelial cells and sometimes with blood or pus. If the quantity of mucus appearing in the stools is considerable, the disease has sometimes been designated mucous diarrhœa, or mucous disease; but there does not seem to me sufficient reason, either anatomical or clinical, for considering it a distinct affection.

The mesenteric glands are ordinarily enlarged, unless in very young infants. They are frequently found as large as a large pea, or even larger, and of a light color, from the anæmic state of the infant. In exceptional instances certain of them are found to have undergone cheesy degeneration. The enlargement of these glands, like that of the solitary follicles and Peyer's patches, is from hyperplasia. The condition of the stomach was recorded in sixty-nine cases. In forty-two it was healthy; in seventeen red, apparently inflamed; in seven of a pink color; and in three there were ulcerations, probably cadaveric. The usual healthy condition of the stomach is a noteworthy fact, taken in connection with the frequent vomiting, in entero-colitis. I have stated elsewhere that stomatitis is also a common complication in protracted and grave cases, accompanied by sponginess of the gums, which bleed if pressed or rubbed. The buccal surface in these cases is more vascular than natural, and, if the vital powers are much reduced, superficial ulceration is not infrequent, especially of the gums. In infants under the age of three or four months, œsophagitis is also a common accompaniment of entero-colitis.

Thrush, though a frequent complication under the age of three or four months, is rare in older infants. Thrush, in infants over the age of eight or ten months, occurring in connection with intestinal inflammation, is an unfavorable prognostic sign, indicating a gravity of the intestinal disease, which commonly eventuates in death.

There exists an opinion in the profession that the liver is in fault in this disease, especially in that form of it which I have described as a summer epidemic of the cities. This opinion is, probably, less prevalent than formerly, but it is still held by many, and it influences, more or less, the choice of therapeutic agents. In the appendix (E) is a table, which presents the condition of the liver in thirty-two cases of this disease. These cases occurred during the summer epidemic.

There was no evidence, from the post-mortem appearance of the liver in these cases, of any congestion, or torpidity, or hyperactivity, or perverted secretion. The size of the liver was in some cases very different in those of about the same age, but probably there was no greater difference than usually obtains among glandular organs within the limits of health. The following table gives the weight of the liver in twenty cases in which the weight of this organ and the age of the patient are recorded:—

Age.		Age.	
4 weeks . .	5 ounces.	10 months . .	6¾ ounces.
2 months . .	3½ "	13 " . .	6 "
2 " . .	3½ "	14 " . .	9 "
4 " . .	5 "	15 " . .	6 "
5 " . .	6½ "	15 " . .	7½ "
5 " . .	9 "	15 " . .	9½ "
7 " . .	4½ "	16 " . .	6 "
7 " . .	6 "	19 " . .	4½ "
7 " . .	6¼ "	20 " . .	9¼ "
9 " . .	8 "	23 " . .	15 "

I do not have access to tables giving the weight of the healthy liver at different ages, but in none of the above cases did the size or the weight seem to me to be above the healthy standard, except in one, in which this organ was quite fatty. But in this case the degeneration and enlargement of the liver were doubtless due to the tubercular disease.

In most of the cases the liver was examined microscopically, and the only fact worthy of note observed was the variable amount of fatty matter. Sometimes it was in excess, sometimes in moderate quantity or rather deficient, and sometimes in greater amount in one portion of the organ than in another.

The prevalent belief, then, that the liver is greatly affected in the summer epidemic of entero-colitis, receives no corroboration from the inspection of this organ. The only pathological state (if it be such) observed in it relates to the amount of oily matter, and this obviously requires no special treatment.

The cutaneous affections complicating entero-colitis have already been alluded to.

Frequently, at post-mortem examinations of infants who have died of entero-colitis, intussusceptions are found in the small intestines. These probably in general occur at the moment of, or not long before, death, but I have in a few instances found intussusceptions which sustained the weight of two feet or more of intestine without being reduced, and which, from being in their interior more vascular than the contiguous membrane either above or below, probably occurred some hours, possibly days, before death, but, being sufficiently pervious to allow the food to pass, symptoms of obstruction were absent.

It has been said, in speaking of the symptoms, that a cough is common in the advanced stages of entero-colitis, particularly when the disease is protracted for weeks or months. From the great emaciation and the character of the cough, the physician as well as friends is very apt to suspect the presence of tubercles. In the eighty-two examinations, however, which I have made of entero-colitis of the summer season, in many of which emaciation was extreme, there were tubercles in only one case. The cough was found to be due to solidification of the posterior and dependent portion of one or both lungs. The exact pathological character of this solidification of lung (hypostatic pneumonitis) is treated of in our remarks on diseases of the respiratory organs.

In the cases of entero-colitis which were complicated with this state of the lungs, I have not usually found enough of the lung tissue involved to make any perceptible difference in the sound on percussion. Its extent of solidification was sometimes not more than two or three lines, and frequently not more than a quarter to half an inch in an antero-posterior direction, although it embraced nearly or quite the entire posterior surface of the lung.

The state of the brain in the entero-colitis of infancy is interesting to the pathologist. When the disease is protracted, this organ wastes like the body and limbs. In the young infant, in whom the cranial bones are still ununited, the occipital and sometimes the frontal become depressed in proportion to the loss of brain substance, so that the cranium is quite uneven. In older children with the cranial bones consolidated, serous effusion occurs according to the degree of waste, thus preserving the size of the encephalon. The effusion is chiefly external to the brain, extending on each side over the convolutions from the base to the vertex. The quantity of serum varies from one or two drachms to an ounce, or even more. The serous effusion is associated with passive congestion of the cerebral vessels and cranial sinuses.

DIAGNOSIS.—The only disease with which infantile inflammation of the intestines is likely to be confounded is non-inflammatory diarrhœa. The means of diagnosticating the one from the other are indeed uncertain. There is no pathognomonic sign or symptom, in the majority of cases, in either affection. Occasionally we are able to diagnosticate colitis from the presence in the stools of mucus or mucus tinged with blood. Abdominal tenderness, which in the adult is so important a diagnostic symptom of intestinal inflammation, is generally absent in the infant, or, if present, is not easily ascertained. The presence of fever and the severity and persistence of the symptoms, render it probable that the disease is inflammatory.

In general I have found that, if diarrhœa continued more than a week in the summer season, it had become inflammatory. Sometimes, however, as I have in at least three cases seen, and as the French physicians state, diarrhœa may continue for a much longer time, attended by extreme emaciation and terminating fatally, and yet at the post-mortem examination no lesion of the intestines be found, except a tumefied state of the intestinal glands. Practically it matters little whether we ascertain the inflammatory or non-inflammatory character of the disease, as we determine the proper mode of treatment from the symptoms and general condition of the patient.

PROGNOSIS.—I have said that intestinal inflammation is one of the most fatal of infantile diseases. Still it is possible, by proper hygienic measures and a judicious selection and use of medicines, to save a large proportion of those affected. Entero-colitis and most of its complications are of such a nature that we may have reasonable hope that the infant will recover if all measures calculated to control the disease are employed. Many do recover from a state of emaciation and feebleness which, occurring in any other pathological state, would be almost necessarily fatal. The most unfavorable symptoms in this disease, except those due to extreme prostration or collapse, arise from the state of the brain. Rolling the head, squinting, feeble action of the pupils, spasmodic or irregular movements of the limbs, indicate the near approach of death. There are many facts which should be taken into consideration in making a prognosis. The age of the infant, the time in the year, the surroundings, especially in reference to the impurity of the atmosphere, are to be considered, as well as the present state of the patient.

Intestinal inflammation of infancy might, in many instances, be prevented by judicious measures. Especially is it preventable in those cases in which the exciting cause is dietetic. The reader is referred to the chapters on weaning and artificial feeding, for facts in reference to this matter. Unfortunately, however, the physician is not generally consulted in regard to the alimentation of the infant, or the time and manner of weaning, or other important matters of regimen, until diarrhœa, inflammatory or non-inflammatory, is established; his purpose is then not to prevent, but to cure.

TREATMENT. *Regimenal Measures.*—Intestinal inflammation of infancy requires somewhat different treatment, according to the cause, as well as the condition of the patient. If it occur in an infant of previous good health, and from exposure to cold, its diet should at first be reduced. If it be nursing, it should take the breast less frequently. It will then receive less nutriment, not only in consequence of the longer interval between the times of nursing, but because the milk remaining in the breast becomes more watery and less nutritious. If thirsty, it may take a little light barley-water or gum-water. If the infant be weaned, a corresponding reduction in its nutriment should be made.

These cases require mild counter-irritation over the abdomen, followed by emollient poultices, or warm water applications covered with oil silk. After the acute stage has passed, more frequent nursing and more nutritious diet should be allowed. Often the alcoholic stimulants in barley-water, and sometimes the animal broths, are required in this stage of the disease. Exhaustion should be guarded against in the infant.

As one of the chief causes of intestinal inflammation of infancy, particularly in the city, is the use of food which does not agree with the digestive system, feeble and easily deranged at that early age, attention should be directed, in those cases in which the disease does not seem to be due to the impression of cold, not only to the nature of the food, but to the mode of its preparation and the quantity given. To the young infant with entero-colitis, no food is so easily digested, and is therefore so suitable, as human milk. The bottle-fed infant, under the age of twelve months, remaining in the city in the summer season, and affected with intestinal inflammation, cannot in general be successfully treated unless it is provided with a wet-nurse. Frequently, when the diarrhœa continues in spite of all other measures hygienic and medicinal, the infant begins at once to improve by the employment of a wet-nurse. It is sometimes really surprising to observe as a consequence of this measure the rapid and complete restoration to health from a state of extreme emaciation.

In certain cases the breast-milk, either of the mother or wet-nurse, disagrees with the infant, and its use aggravates the intestinal disease. In the country, or in the city in the cool months, weaning may be proper under such circumstances. Certainly weaning or the employment of another wet-nurse is required. In the city in the summer months, for reasons elsewhere fully stated, weaning is a very injudicious if not fatal measure, and, if the entero-colitis is aggravated by the character of the mother's milk, a wet-nurse should be engaged. If the breast-milk is suspected as the cause or one cause of the infant's sickness, it should be examined by the microscope, before a change in diet or in nursing is recommended. It has been ascertained by the microscope, that the elements of colostrum which have a purgative effect may return at any period of lactation.

If the mother's milk disagrees, and a wet-nurse for any reason is not employed, it is then necessary to recommend a diet which will be the best possible substitute for the natural aliment. Well-boiled barley-water, or Ridge's food, the basis of which is wheat-flour, the upper third of cow's milk when it has stood two or three hours, the expressed juice of lean beefsteak slightly roasted, and scraped raw beef, may be mentioned among the articles of diet which I have found useful in these cases. For facts in reference to artificial feeding, and for dietary formulæ, the reader is referred to chapters relating to the diet of infancy.

Attention to the diet of infants affected with intestinal inflammation is obviously of the utmost importance, but one chief cause of the disease, especially of the great summer epidemic of the cities, we have seen to be atmospheric. This requires attention on the part of the practitioner to a different matter in the hygienic management of these cases, namely, the state of the air which the infant breathes. In the cool months, the atmosphere is more pure than in the summer months, as it contains less of those noxious gases which arise from decaying animal and vegetable substances. In those months, then, in which the weather is such that there is no decomposition of organic matter, the atmospheric cause of entero-colitis is not operative, and little is gained for the patient by change of locality. But in the summer season one of the most important conditions of successful treatment of this and the other diarrhœal maladies of infancy is the removal of patients from an impure to a pure atmosphere. Physicians of experience all agree in the choice of elevated localities, containing a sparse population, and remote from the sea-shore. Many are the instances every summer in this city of infants removed to the country with intestinal inflammation, with features haggard and shrunken, with limbs shrivelled and skin lying in folds, too weak to raise or at least hold their heads from the pillow, vomiting nearly all the nutriment taken, with stools frequent and thin, resulting in great measure from molecular disintegration of the tissues, presenting indeed an appearance seldom seen in any other disease except in the last stages of phthisis, and returning in late autumn, with the cheerfulness, vigor, and rotundity of health. The localities usually preferred by the physicians of this city are the elevated portions of New Jersey and Eastern Pennsylvania, the Highlands of the Hudson, the central and the northern parts of New York State, and Northern New England. Taken to a salubrious locality, the infant will soon begin to improve after it has recovered from the fatigue of travelling, unless the case is incurable.

Sometimes parents, not noticing the immediate improvement which they had been led to expect, return to the city without giving the country fair trial, and the life of the infant is almost necessarily sacrificed. Returned to the foul air of the city while the weather is still warm, it sinks rapidly from an aggravation of the malady. Dr. James Jackson recommends, if the infant do not improve where it is taken, that it should be conveyed to another locality. This is good advice, provided the selection be made of a place elevated, remote from the sea-shore, and having a sparse population. The infant, although it has recovered, should not be brought back while the weather is still warm. One attack of the disease does not diminish but increases the liability to a second seïzure.

If the situation of the family is such that it is not practicable to take the infant to the country, and such cases are frequent among the poor, it should be kept much of the time in the open air; it is a common practice in this city to take such patients in the daytime to the sea-shore, or upon ferry boats. Dr. E. H. Parker says: "Many of my patients are sent to the ferries to cross them, so that the cool fresh sea breeze may fan them, and it acts sometimes like magic, to raise their drooping heads." I have not observed such marked benefit in these cases from the sea breeze as from the air of elevated localities, which can generally be found in the vicinity of cities, and are easily accessible.[1]

Medicinal Treatment.—Sometimes it is proper to commence treatment by the employment of a gentle purgative, particularly when the disease commences abruptly from a state of previous good health. It is then frequently caused by exposure to cold, or more rarely by some indigestible and highly irritating substance in the intestines. In such patients, there is often a full habit. The pulse is strong and quick, the heat of surface great, the face perhaps flushed, the stools sometimes slimy and bloody, sometimes green or brown. It is proper and often serviceable, when there is this commencement of the affection, to give a single dose of castor oil or syrup of rhubarb. Any indigestible substance, if present, is removed from the intestine, and opiates or other remedies designed to control the disease may then be more successfully employed. Such cases occur in the winter not less than in the summer, and in all localities, rural as well as in the city. But the summer epidemics of intestinal inflammation in the cities do not in general require such preliminary treatment. Diarrhœa, moderate, perhaps, has already continued for a time when the physician is called, and no irritating substance remains except the acid, which is abundantly generated in the intestine in this disease, and which we have a means of removing without purgation. Preliminary treatment having been employed or not, according to the nature of the attack and condition of the patient, remedies calculated to arrest the inflammation should then be prescribed.

---

[1] The remarks made in reference to the use of pepsin in indigestion and non-inflammatory diarrhœa apply also to those cases of inflammatory diarrhœa which are due to feebleness of the digestive function.

The medicines which should be employed are chiefly of three kinds, namely, alkalies, opiates, and astringents; sometimes one or two kinds only, and sometimes all three, according to the character of the evacuations. The antacid treatment is, of course, required in those numerous cases in which the stools are acid, and there is no better alkaline remedy for the diarrhœa in this disease than the preparations of chalk. The creta præparata of the pharmacopœias, in doses of two or three grains to a child one year old, or the mistura cretæ in teaspoonful doses, are eligible preparations, and are commonly employed. These medicines should be repeated in two hours, or a longer time, according to the state of the patient. Chalk given for a moderate period is innocuous, and may be administered to the youngest child.

In Europe the crab's eye is much used, and it is stated that it is sometimes effectual in controlling the disease, when the chalk fails. The following is a formula recommended by Bouchut:—

℞. Ocul. cancror. pulv. gr. x;
Aq. fœniculi,
Syr. rhei, āā ℥ss. M.

One teaspoonful every hour. In this country the same antacid has been also employed, though less frequently than the preparations of chalk. J. F. Meigs, of Philadelphia, prescribes it as follows:—

℞. Ocul. cancror. pulv. ʒj;
Acaciæ pulv. ʒij;
Sacch. alb. ℈j;
Aq. fontis,
Aq. cinnamom., āā ℥jss. M.

A teaspoonful four, five, or six times daily. By means of this alkali alone, aided by proper hygienic measures, the disease is sometimes arrested, but, unless circumstances are favorable and the case is mild, other medicines are required.

Opium is used by most practitioners in the treatment of intestinal inflammations of infancy. Either as a main remedy or adjuvant it is employed, and properly, in nearly all severe cases. For a young infant paregoric is an eligible preparation of opium. For
the age of one month, the dose is three to fiv
of six months, ten to twelve drops, repeat
longer time, according to the state of the
of six months, the stronger preparatio

quently used. At the age of one year, the liq. opii compositus or tincture opii may be given in doses of one to two drops. Dover's powder is also an excellent medicine in this disease, given in doses of three-fourths of a grain to an infant one year old.

Opium is, however, in general best given in mixtures which will be mentioned hereafter. It quiets the action of the bowels, and diminishes the number of evacuations. It is contra-indicated or should be used with caution if cerebral symptoms are present. Sometimes in the commencement of the disease, if there is much febrile reaction, the patient may be drowsy and in danger of convulsions. Then opiates should be given cautiously or withheld. Also in the advanced stages of this disease, when, perhaps, there is more or less serous effusion in the cranial cavity, opium should be cautiously used, as it might tend to produce that fatal stupor, in which the unfavorable cases are apt to terminate.

Astringents are required when the evacuations are thin and frequent, and are not sufficiently controlled by the remedies already mentioned. Those of a vegetable nature are usually preferred, as they are compatible with chalk, and may be given in combination with it. The astringents commonly used are, catechu, kino, krameria, tannic and gallic acids. Logwood and blackberry roots are also occasionally employed.

If the disease become chronic, nitrate of silver and acetate of lead are sometimes useful. Astringents should not be given if the stools are scanty and consistent though frequent, nor should they be employed if the evacuations are muco-sanguinolent, as in the dysentery of the adult.

I will now mention the various combinations of medicines which have been found the most useful in intestinal inflammation.

In all those cases in which the evacuations consist chiefly of mucus, or mucus and blood, and in all recent cases in which the evacuations are scanty, and there is considerable fever, one of the best formulæ is the following, which is similar to that recommended by Dr. West:—

℞. Tinct. opii gtt. xij;
Pulv. gum acac.,
Pulv. sacch. alb., āā ʒj;
Ol. ricini ʒj to ʒij;
Aq. cinnamom. ℥jss. M.

One teaspoonful every three hours. In these cases, also, Dover's powder, given at the same interval with half a teaspoonful of castor oil once or twice daily, will have good effect in controlling the disease.

In the more common forms of infantile entero-colitis, in which the stools are green, or brown, or yellow, and are watery and frequent, one of the best medicines is the pulv. cret. comp. c. opio, combining, as it does, alkali, opiate, and astringent.

Three grains may be given every two or three hours to a child one year old, till the diarrhœa is controlled. For young infants paregoric, catechu, and chalk, as recommended in the treatment of non-inflammatory diarrhœa, is a useful mixture. Laudanum or liq. opii compos. in proper quantity may be substituted in place of the paregoric, and kino or krameria in place of the catechu.

Gallic or tannic acid is sometimes administered with Dover's powder, or with the compound powder of chalk and opium, but given in this way it is nauseating and apt to be vomited. If the evacuations are not frequent or watery, the opiate and chalk mixture may be prescribed without the astringent with a good effect.

I do not know that any benefit is gained in intestinal inflammation of the infant by the use of mercurials, and in many cases certainly much harm would result. They are not now commonly prescribed in the enteritis or colitis of adults, and there is no lesion in infantile entero-colitis, either as regards the liver or intestines, which requires their administration. In the choleriform diarrhœa, which sometimes precedes intestinal inflammation, the use for a day or two of small doses of calomel or hydrarg. cum cret. is thought by some judicious practitioners to be of service, but, when it has appeared to be beneficial in intestinal inflammation, the good effect is probably due chiefly to the opium which is administered with the mercurial.

Often the disease continues, notwithstanding the use of the above remedies, or if temporarily relieved, the causes still operating, it returns. In these protracted cases, attended perhaps with more or less ulceration of the mucous membrane, the mineral astringents may be prescribed. Acetate of lead may be given in doses of one-fourth of a grain to an infant one year old. Nitrate of silver is, however, more frequently prescribed in Europe, especially on the continent. It may be given in doses of one-twentieth to one-twelfth of a grain in a little mucilage or simple syrup.

Enemata.—These are of great service in many cases of intestinal inflammation. At any stage of the disease, when the stomach is irritable and medicines are not retained, they may be advantageously employed. Laudanum especially is often given in this way to the infant with great benefit. It may be prescribed mixed with a little starch water, and the best instrument for administering it is a small glass or gutta-percha syringe, the nurse retaining the enema for a time by means of a compress. Beck, in his *Infant Therapeutics*, advises to give by injection twice as much of the opiate as would be administered by the mouth. A somewhat larger proportion may, however, be safely employed. Astringents may also be given by enema. Bouchut, speaking of these therapeutic agents, says: "All these substances may be given as enemata, composed of three to six ounces of the vehicle holding in solution seven to ten grains of the extract of rhatany or monesia. If tannin is used, it should be in the dose of four to seven grains. In the same way and for the same end, fifteen to thirty grains of alum, or, better still, less than one grain of the nitrate of silver. These last enemata are daily employed at the Necker Hospital. If their use is not constantly followed by success, there always results, at least, a decided amelioration quite capable of dissipating the objections raised against their employment."

Since the inflammation is ordinarily most intense in the descending colon, and is sometimes confined to this portion of the digestive tube, benefit results in certain obstinate cases from the injection into the rectum of a solution of nitrate of silver in warm distilled water in the proportion of one grain to six or eight ounces. A little laudanum may be added. This treatment has been employed in the Nursery and Child's Hospital, but only as an adjuvant to remedies administered by the mouth.

In most of those cases of intestinal inflammation which occur under the depressing effect of warm weather, alcoholic stimulants are required almost from the commencement of the disease, and their use is beneficial in chronic or protracted cases, whatever the cause or season. Bourbon whiskey or brandy is the best of these stimulants, and it should be given in small doses, repeated at intervals of two hours. I have usually ordered three or four drops to an infant one month old, and an additional drop or two drops for each month. The stimulant is not only useful in sustaining the vital powers, but it also aids in relieving the irritability of stomach.

The diarrhœa is, in general, more easily controlled than the vomiting. A remedy which with me has been useful in relieving the latter symptom is the neutral mixture:—

℞. Potas. bicarbonate gr. xxv;
Acid. citric. gr. xvij;
Aq. amygdal. amaræ ℥j;
Aquæ ℥ij. Misce.

Dose, one teaspoonful to a child from eight to twelve months old, repeated according to the nausea or vomiting. The following prescription to relieve this symptom, which is similar to one employed in the Nursery and Child's Hospital of this city, has the desired effect in a certain proportion of cases:—

℞. Acid carbolic, gtt. ij;
Aq. calcis ℥ij. Misce.

Dose, one teaspoonful with a teaspoonful of milk, breast-milk if the infant nurses, repeated according to the symptoms. Lime-water alone sometimes diminishes the vomiting when there is great acidity, but it is rendered more effectual by the addition of carbolic acid. Vomiting is frequent in the summer epidemics of intestinal inflammation in the cities, and it is in this form of the disease, induced by an impure atmosphere and an unsuitable diet, that I have observed the greatest benefit from the above prescriptions. When the inflammation occurs in other seasons, and is produced by other causes, vomiting is less frequent, and is more easily controlled. It may then require no special treatment.

While I approve the above mode of treatment, which is reprinted from the first edition, more recent experience, and especially observations made in the large class of children's diseases in the Out-door Department at Bellevue, convince me that the subnitrate of bismuth is a valuable remedy not only for this disease, but also for cholera infantum, and one which is appropriate in most cases. It has, indeed, long been used in the diarrhœal affections of infancy, but in doses much too small. Its effect is believed to be entirely local, namely upon the gastro-intestinal surface and its secretions. It undergoes or effects some chemical change, for the stools after its use become dark, and at the same time more consistent. While it diminishes the frequency of the evacuations, it is at the same time one of the most efficient antiemetics. The following formula is for an infant one year old:—

℞. Bismuth. subnit. ʒj;
Pulv. cret. comp. c. opii ʒss. Misce.
Divid. in chart. No. x. One powder every three hours.

I believe that this is the best remedy that can be prescribed for the epidemic entero-colitis of the summer months in the cities, in which disease there is ordinarily great irritability of the stomach. It is readily administered mixed with a little sugar and moistened. It is useful in recent as well as protracted cases. If there is no decided irritability of stomach or acidity of the stools, Dover's powder may be substituted for the powder of chalk and opium, and it is preferable in those cases in which the entero-colitis results from taking cold, and there is a strong febrile reaction.

When the disease is chronic, and the vital powers begin to fail, as indicated by pallor, more or less emaciation, and loss of strength, the following is the best tonic mixture with which I am acquainted. It aids in restraining the diarrhœa, while it increases the appetite and strength. It should not be prescribed until the inflammation has assumed a subacute or chronic character.

℞. Tinct. colombæ. ʒiij;
Liq. ferri nitratis gtt. xxiv;
Syr. simplic. ℥iij. Misce.

Dose, one teaspoonful every four hours to an infant of one year. In the Out-door Department at Bellevue we commonly give this tonic alternately with the bismuth powders.

External Treatment.—Some writers recommend depletion in this disease by leeches, advice likely to do much harm, unless the particular cases are described in which it may possibly be of service. It can be useful only in those cases in which the infant is robust and of full habit, and the disease commences suddenly with decided febrile reaction. Such cases are oftenest seen with us in the winter season, and even these are ordinarily best treated without loss of blood. Sinapisms and poultices usually are sufficient as local measures. In these cases, also, the warm mustard foot-bath should be employed, and repeated if there is restlessness or cerebral symptoms.

In all forms of intestinal inflammation in infancy and in all its stages, mild counter-irritation over the abdomen is often useful, but vesication, by increasing the restlessness of the infant and reducing its strength, without materially modifying the severity or duration of the disease, does more harm than good. It is not to be thought of as a remedial measure. I have known a troublesome sore continuing till death, and probably hastening this result, to occur from this treatment. Poultices or fomentations over the abdomen are sometimes beneficial, especially those of a mildly irritating nature. A poultice of powdered cloves, cinnamon, and ginger, or of linseed meal to which a little mustard is added, may be employed, or, better than either, a linseed poultice spread thin, under which a single layer of muslin is placed, saturated with tincture of camphor, and over both oil silk. In the entero-colitis of infants, occurring in the cool months, and due to exposure to cold, this treatment is especially useful. In the epidemic entero-colitis of the summer months, which may be aggravated by heat, treatment by poultices may be injudicious, but in such cases it is proper to produce moderate redness over the abdomen by temporary applications.

Some physicians believe that dentition is a cause of infantile entero-colitis, and advocate lancing the gums if they are found swollen. In my opinion, this treatment, in genuine inflammation, is opposed by both reason and experience.

CHAPTER IX.

ENTERITIS AND COLITIS IN CHILDHOOD.

Intestinal inflammation in childhood differs materially from the form or type which it commonly presents in infancy. Its causes, symptoms, and extent differ in important particulars in the two periods. In childhood there is not ordinarily such extensive inflammation of the mucous membrane of the intestines as we have seen is present in the majority of cases in infancy, and it may, therefore, be properly treated as two diseases, according to the seat of the morbid process, namely, enteritis and colitis. Both these affections in the child resemble so closely the form which they exhibit in adult life, that no extended description is needed in this connection.

Causes.—These are vicissitudes of temperature, especially sudden change from warm to cold, which checks the perspiration, and causes a determination of blood from the surface to the viscera. These inflammations are also caused sometimes by irritating substances in the intestines. I have known fæcal accumulations as well as worms to produce severe dysentery in the child, accompanied by the characteristic tenesmus and muco-sanguineous stools, and ceasing as soon as the offending substances were expelled. The use of unripe or stale vegetables, if there is a strong predisposition to mucous inflammation, may be a sufficient cause, and some of the most dangerous cases are due to the accumulation in the intestines of seeds and the parenchyma of fruits. But the most common cause is that mentioned, namely, sudden exposure to cold when the body is heated, a danger to which children are especially liable, on account of the easy disturbance of the circulatory system in them, and their heedless exposure of themselves, unless incessantly watched.

Enteritis and colitis are also frequently secondary diseases. They occur in children as complications or sequelæ of the eruptive fevers, especially measles.

SYMPTOMS.—The alvine discharges in enteritis and colitis in childhood are such as occur in these diseases at a more advanced age. In enteritis they are thin and of the natural color, or occasionally green; in colitis they are more consistent than in enteritis, and are largely muco-sanguineous. Sometimes in enteritis, if the inflammation is not intense, the diarrhœa is slow in appearing, or it may be slight, so as not to attract special attention. The disease may then resemble remittent fever, for which it is at times mistaken. The upper part of the small intestines is less frequently affected than the lower. If there is duodenitis, the flow of bile is occasionally impeded from tumefaction at the mouth of the common bile-duct, and the icteric hue appears. In both enteritis and colitis there is abdominal tenderness, with more or less constant pain if the disease is severe, and in colitis, tormina, and tenesmus. The pulse is accelerated, the heat of surface augmented, the face flushed, and, except in mild cases, indicative of suffering. In many children at the commencement of the inflammation the nervous system is profoundly affected, as indicated by headache, stupor, twitching of the limbs, and sometimes by convulsions. The chief danger at the commencement of the disease is, indeed, from this source. Sometimes there is irritability of the stomach, and the food is rejected, though much less frequently than in the intestinal inflammation of infancy. Anorexia and thirst are common symptoms. If the inflammation continue, there is soon perceptible emaciation, with loss of strength. The eyes become hollow, the face pale, and the surface cool. Death may occur at an early period, the vital powers succumbing from the intensity of the inflammation. In other cases, the acute disease ends in a subacute or chronic inflammation; the patient becomes gradually more reduced, till he dies in a state of extreme emaciation, such as we often observe in the entero-colitis of infancy, or from this state he may recover by degrees, though perhaps with an irritable state of the bowels, which continues for months. In a majority of cases, however, enteritis and colitis in childhood, if not neglected soon begin to yield, and terminate favorably in one or two weeks.

DIAGNOSIS.—It is not difficult to determine the existence of the inflammation. This is indicated by the fever, abdominal tenderness, and the relaxed state of the bowels. Whether the disease is enteritis or colitis is determined by the character of the stools, the seat of the tenderness, and the presence or absence of tenesmus.

PROGNOSIS.—It has been stated above that enteritis and colitis in children commonly terminate favorably. The result depends not only on the extent and severity of the inflammation, but the constitution and previous health. The inflammation is more serious when secondary than when primary. Extensive and great tenderness of the abdomen, features pale, anxious, and indicative of suffering, pulse frequent and feeble, should excite the most serious apprehensions. Frequent vomiting also denotes a grave form of the disease. Stupor, and especially convulsive movements, show that the nervous centres are affected, and should make us guarded in the prognosis. Improvement in the disease, on which to base a favorable prognosis, is apparent in the diminution of the tenderness, improvement in the pulse and character of the stools, a more cheerful countenance, and less disrelish of food.

TREATMENT.—This should be similar to that employed in the adult. In enteritis at the commencement of the disease, if there is reason to suspect the presence of any irritating substance in the intestines, and ordinarily in colitis, it is advisable to commence treatment by the use of some simple evacuant, like castor oil. After this our reliance, so far as internal treatment is concerned, must be mainly on opiates, or opiates with diaphoretics. One of the best remedies of this class is the Dover's powder, which may be given to a child five years old in doses of three grains every three hours. A corresponding dose of any of the other opiates may be given, but with less sudorific effect. In colitis the occasional administration of a laxative should not be neglected, if the stools are entirely or mainly muco-sanguineous. It should be employed so as to prevent accumulation of fæcal matters in the colon, which would serve as an irritant and increase the inflammation. The dose should be small, merely sufficient to produce a fæcal evacuation, and repeated as required, daily or less frequently. The laxative commonly preferred is Rochelle salts or castor oil. The physician may prescribe an opiate mixture containing sufficient of the laxative to have the effect desired, though ordinarily it is better to prescribe the two separately, so that the laxative can be given or withheld, according to circumstances, while the opiate is continued more regularly.

When the stage of active inflammation has passed, if there is still looseness of the bowels, astringents should be employed in connection with the opiate. The tincture of catechu or kino may be given with an equal quantity of paregoric. The subnitrate of bismuth in doses of from five to ten grains in combination with Dover's powder or other opiate will also be found useful.

Acetate of lead with opium, so much used in adult cases, is equally serviceable in children. One grain may be given to a child of five years with one-third of a grain of opium. Injections properly administered aid in controlling the inflammation. Those containing opium are especially serviceable in relieving the tenesmus of dysentery. When the stomach is irritable, or when it is desired to use a medicine like tannic acid, which is unpleasant to the taste, it is often best to administer it in the form of enemata or suppositories.

Local treatment is highly important in the enteritis and colitis of childhood. Leeches in the commencement of the inflammation have a good effect in moderating its intensity. If the disease is secondary, or there is scrofula or a state of feebleness, depletion is contra-indicated.

Apart from leeching, the local treatment should consist in the use of emollient applications covered with oil-silk, and made sufficiently irritating by mustard or otherwise to cause constant redness.

If there are symptoms threatening convulsions, a mustard foot-bath repeated occasionally will usually tranquillize the nervous system and avert the danger.

The diet should be bland and unirritating. In the first stages of the inflammation, rice or barley-water, or arrowroot boiled in water, and similar drinks should constitute the main diet. When the active inflammation has abated, and at any period of the disease if there is a tendency to prostration, more nourishing food should be given. Milk and animal broths may then be allowed. In cases which are protracted, or attended with symptoms of exhaustion, alcoholic stimulants are required.

CHAPTER X.

CHOLERA INFANTUM.

Cholera infantum, or, as it is sometimes called, choleriform diarrhœa, is a disease of the summer months; and, with exceptional cases, of the cities. It receives the name which designates it from the violence of its symptoms, which closely resemble those in Asiatic cholera. It is, however, quite distinct in its nature, occurring independently of the epidemics of that disease. Post-mortem examinations establish the fact that it is a non-inflammatory diarrhœa, but on account of the violence and striking character of its symptoms, and its great mortality, it is proper to describe it as a distinct disease.

I have elsewhere stated that, as regards at least this city, the term cholera infantum has been so extended as to embrace a large part of the diarrhœal maladies affecting infants in the summer months. Some physicians apply it even to mild but protracted cases of ordinary non-inflammatory or inflammatory diarrhœa occurring in the season mentioned. I employ it, and it should, in my opinion, only be employed, to designate that form of infantile diarrhœa in which there are frequent watery, perhaps serous stools, accompanied by vomiting and rapid and great emaciation. Moreover, when the disease ceases to be of this character, the term cholera infantum should no longer be applied to it, but it should receive another name indicative of the pathological state which has supervened. Intestinal inflammation frequently succeeds cholera infantum, and certain writers describe it as a stage of that disease. Properly, the inflammation should be regarded as a distinct affection, just as the enteritis, which sometimes results from cholera morbus, is not considered as a stage of that disease, but as a disease in itself.

The number of deaths from cholera infantum reported in our bills of mortality is so large, while the number from the same disease embraced in the death statistics of European cities is so small comparatively, that some have been led to believe that this affection, whether termed cholera infantum, or, as by French writers, choleriform diarrhœa, is much more prevalent and fatal in this country than in Europe, whereas, were these terms employed in all places to designate precisely the same disease, probably no great difference would be found in the prevalence of cholera infantum on the two sides of the Atlantic.

CAUSES.—It has been stated that cholera infantum prevails mainly in the cities and in the summer months. Cases occur from the month of May to October. Its maximum frequency and severity correspond with the degree of heat, and it is therefore most prevalent in the months of July and August. One of the chief causes of this disease is, doubtless, residence in an atmosphere loaded with noxious vapors, especially gases arising from animal and vegetable decomposition, or an atmosphere rendered impure by overcrowding and by personal and domiciliary uncleanliness. It is, therefore, much more common in tenement-houses and parts of the city occupied by the poor than in cleaner and less crowded streets and apartments.

Summer heat and the anti-hygienic conditions to which it gives rise in the cities, sometimes appear to be sufficient in themselves to develop cholera infantum; at least it occurs without other obvious cause. In other, and probably the majority of cases, another cause co-operates, namely, the use of improper food. Atmospheric heat and its depressing influences are then predisposing causes, while the use of indigestible or irritating food is the exciting cause. Infants upon whom both causes are operative are most liable to cholera infantum in its severe form. Hence bottle-fed infants of the city are especially liable to it, and infants whose food is carelessly and improperly prepared. Often in the hot months, acid and indigestible fruits, as currants, heedlessly given to an infant, occasion the attack.

Cholera infantum occurs commonly under the age of two years. It is so frequent during the period of first dentition, that some writers consider dentition a cause. At this period, however, as has been stated elsewhere, there is great functional activity, and rapid development of the intestinal follicles, and the peculiar liability to cholera infantum at this age should be attributed to this cause rather than to dentition.

SYMPTOMS.—Cholera infantum sometimes commences abruptly, the previous health having been good. In other cases it is preceded by a premonitory stage, that of simple diarrhœa. The stools are thinner than natural, and somewhat more frequent, but not such as to excite alarm. Suddenly the evacuations become more frequent and watery, and the parents are surprised and frightened by the rapid sinking and real danger of the infant. Occasionally this antecedent diarrhœa has continued several weeks, attended with emaciation, and associated, perhaps, with intestinal inflammation.

This disease is characterized by the discharge of thin stools, designated by some watery, by others serous. The first evacuations, unless there has been previous diarrhœa, contain considerable fæcal matter. They are so thin as to soak into the diaper almost like urine, and in some cases they scarcely produce more of a stain than does this secretion. The odor is peculiar, not fæcal, but musty and offensive; occasionally the stools are almost odorless. Commencing simultaneously with the watery evacuations, or soon after, is another symptom, namely, irritability of the stomach, which increases greatly the prostration and danger. Whatever is swallowed by the infant is rejected immediately, or after a few minutes, or there may be retching without vomiting. The appetite is lost, and the thirst is intense. Cold water, especially, is taken with avidity, and if the infant nurses, it eagerly seizes the breast, in order to relieve the thirst. The tongue is moist at first, and clean or covered with a light fur. The pulse is accelerated, while the respiration is either natural or somewhat increased in frequency; the surface is warm, but its temperature is speedily reduced. There is no abdominal tenderness, and no evidence of pain. The infant is often restless at first, but its restlessness is due to thirst, or that unpleasant sensation which the sick experience when the vital powers are rapidly reduced. The urine is scanty in proportion to the gravity of the attack.

The loss of strength and the emaciation are more rapid than in any other diarrhœal malady, except Asiatic cholera, and the most severe form of cholera morbus. The parents scarcely recognize in the changed and melancholy aspect of the infant any resemblance to the features which it exhibited a day or two before. The eyes are sunken, the eyelids and lips are permanently open from the feeble contractile power of the muscles which close them, while the loss of the fluids from the tissues and the emaciation are such that bony angles become more prominent, and the skin in places lies in folds.

As the disease approaches a fatal termination, which often occurs in two or three days, the infant remains quiet, not disturbed even by the flies which alight upon its face. The limbs and cheeks become cool; the eyes bleared, and pupils contracted. A state of stupor results, from which there is no relief, and which after a few hours ends in death.

Often, even in cases which are ultimately fatal, there is not such a speedy termination of the disease. The choleriform diarrhœa ends in inflammation, which runs a protracted and obstinate course. The disease then becomes the entero-colitis, inflammatory diarrhœa, or intestinal inflammation of writers.

In the most favorable cases of cholera infantum the patient recovers before the supervention of inflammation.

ANATOMICAL CHARACTERS.—Rilliet and Barthez, who of foreign writers treat of this disease at greatest length, describe it under the name of gastro-intestinal choleriform catarrh. "The perusal," they remark, "of the anatomico-pathological description, and especially the study of the facts, show that the gastro-intestinal tube in subjects who succumb to this disease may be in four different states: (*a*), either the stomach is softened without any lesion of the digestive tube; (*b*), or the stomach is softened at the same time that the mucous membrane of the intestine, and especially its follicular apparatus is diseased; (*c*), or the stomach is healthy whilst the follicular apparatus, or the mucous membrane, is diseased; (*d*), or, finally, the gastro-intestinal tube is not the seat of any lesion appreciable to our senses in the present state of our knowledge, or it presents lesions so insignificant that they are not sufficient to explain the gravity of the symptoms.

"So far the disease resembles all the catarrhs, but what is special is the abundance of the serous secretion, and the disturbance of the great sympathetic nerve.

"The serous secretion, which appears to be produced by a perspiration (analogous to that of the respiratory passages and of the skin) rather than by a follicular secretion, shows, perhaps, that the elimination of substances is effected by other organs than the follicles; perhaps, also, we ought to see a proof that the materials to eliminate are not the same as in simple catarrh. Upon all these points we are constrained to remain in doubt. We content ourselves with pointing out the fact."

American writers very generally divide cholera infantum into three stages, the first characterized by turgescence of the intestinal follicles without inflammation, but perhaps attended by more or less softening of the mucous membrane. In the second stage intestinal inflammation is present. The mucous membrane of the intestines is vascular in patches and streaks, sometimes thickened, and the solitary glands and patches of Peyer are inflamed, and occasionally certain of them are ulcerated. In the third stage the brain is involved. The cranial sinuses, veins, and capillaries of the brain are congested, and there is transudation of serum upon the surface of the brain or in the ventricles. But the second and third stages of these writers pertain, in my opinion, as I have already said, to entero-colitis, a supervening disease, and distinct from cholera infantum. The anatomical character of the first stage alone is that of cholera infantum, as the disease is understood by us. In our restricted use of the term, the appreciable lesions in cholera infantum are seen to be similar to those in the common forms of non-inflammatory diarrhœa. The following observations show the character of these lesions:—

On the first of August, 1861, I made an autopsy of an infant sixteen months old, who died of cholera infantum, with a sickness of less than one day. The examination was made thirty hours after death. Nothing unusual was observed in the brain, except, perhaps, a little more than the ordinary injection of vessels at the vertex; no disease of stomach and intestines except enlargement of the patches of Peyer as well as the solitary glands; mucous membrane pale. In this and the following cases there was apparently slight softening of the intestinal mucous membrane; but whether it was pathological or cadaveric is uncertain, as the weather was very warm. The liver seemed healthy. Examined by the microscope, it was found to contain about the normal amount of oil-globules.

The second case was that of an infant seven months old, wet-nursed, who died July 26th, 1862, after a sickness also of about one day. He was previously emaciated, but without any definite ailment. The post-mortem examination was made on the 28th. The brain was somewhat softer than natural, but was otherwise healthy. There was no abnormal vascularity of the membranes of the brain, and no serous effusion within the cranium. The mucous membrane of the intestines was of healthy appearance throughout, except that the solitary glands of the colon were enlarged. The patches of Peyer were not distinct.

At the New York Prostestant Episcopal Orphan Asylum, an infant twenty months old, previously healthy, was seized with cholera infantum on the 25th of June, 1864. The dejections, as is usual in that disease, were frequent and watery, and attended by obstinate vomiting. Death occurred in slight spasms, in thirty-six hours. The exciting cause was apparently the use of a few currants, which were eaten in a cake the day before, some of which fruit was contained in the first evacuations. The brain was not examined. The only pathological changes which were observed in the stomach and intestines were slight vascular patches in the small intestines, scarcely sufficient to be considered inflammatory or even congestive, and an unusual prominence of the solitary glands in the colon. These glands resembled small beads imbedded in the mucous membrane. The lungs in the above cases were healthy, excepting hypostatic congestion.

The lesions in the above cases obviously lacked those characters which indicate an inflammatory disease. The observations of others correspond with our own in reference to these severe and suddenly fatal cases.

Dr. Hallowell, in a paper on this disease published in the *American Journal of the Medical Sciences*, July, 1847, says of the anatomical characters of the first stage: "These consist in an undue development of the follicles, both of the stomach and intestines, or of one of those organs, without inflammation of the mucous membrane."

Dr. E. H. Parker, in a paper read before the New York State Medical Society, February 4th, 1857, says: "When death occurs from the exhaustion produced by the profuse vomiting and diarrhœa, a condition to which is given in this country the name of cholera infantum, we find the intestines to contain more or less of a soft, usually light yellow fæcal matter, and the stomach a fluid resembling a thin gruel. The walls of the stomach are natural, unless the epithelial lining be a little too easily removed, the epithelial lining of the small intestines and sometimes of the large being in a similar state. The walls of the intestines are almost translucent, bloodless and apparently thin. Throughout their whole extent the solitary and agglomerated glands are very prominent, setting up almost like beads upon the surface."

Both these writers, as well as Stewart in his monograph on cholera infantum, admit the frequent termination of the pathological state just described, in other words, of cholera infantum, according to our restricted use of the term, in entero-colitis. Most writers, as we have elsewhere stated, regard the entero-colitis as an advanced stage of cholera infantum. I believe that the opinion of writers is correct, that there is usually in chlorea infantum softening of the gastro-intestinal mucous membrane, at least in places. But as the autopsies in this disease are made in the warmest weather, and after the lapse of several hours, it is difficult to decide how much of this change pertains to this disease and how much is post-mortem.

With the exception of the organs of digestion, no uniform lesion is observed in any of the viscera, unless such as is due to change in the quantity and fluidity of the blood, and in its circulation. Writers describe an anæmic appearance of the thoracic and abdominal viscera, and occasional passive congestion of the cerebral vessels. The cerebral symptoms often present towards the close of life in unfavorable cases of cholera infantum may arise from a state of the brain similar to, if not identical with, spurious hydrocephalus, which state is not attended by any uniform or certain lesion of this organ. As the urinary secretion is scanty or suppressed, cerebral symptoms may in certain cases be due to uræmia.

Diagnosis.—This disease is diagnosticated by the symptoms, and especially by the frequency and character of the stools. The stools have already been described as frequent, often passed with considerable force, deficient in fæcal matter, and thin, so as to soak into the diaper almost like urine. The vomiting, thirst, rapid sinking, and emaciation serve to distinguish cholera infantum from other diarrhœal affections.

When Asiatic cholera is prevalent, the differential diagnosis of the two diseases is difficult if not impossible.

Prognosis.—This is one of those diseases in regard to which physicians often injure their reputation by not giving sufficient notice of the danger, or even by expressing a favorable opinion, when the case soon after ends fatally. A favorable prognosis should seldom be expressed without qualification. If the urgent symptoms are relieved, still there is danger of the occurrence of intestinal inflammation, which, in hot weather, is formidable and often fatal. If the stools become more consistent and less frequent, without the occurrence of cerebral symptoms, we may confidently express the opinion that there is no present danger.

The duration of true cholera infantum is short. It either ends fatally, or it begins soon to abate and ceases, or it is transformed into an inflammation. Death may occur, in twenty-four or forty-eight hours, in a state of collapse, from the frequency of the stools, or not till after three or four days. In general, if the patient is not relieved in three or four days, entero-colitis commences.

Treatment.—The frequency and watery character of the stools in cholera infantum, and the consequent rapid sinking of the infant, call for prompt measures for the arrest of the disease. If there is any irritating substance in the stomach or intestines, which acts as an exciting cause of the vomiting or diarrhœa, or at least aggravates it, it is proper to commence treatment by the use of some evacuant. Dr. James Jackson (*Letters to a Young Physician*) says: "In the acute attacks of cholera infantum, the first object is the dislodgement of offending materials from the alimentary canal. In most cases the spontaneous efforts suffice to clear the stomach. But, occasionally, it is evident that these efforts fail to remove a load which the patient has imprudently been permitted to take into the stomach. Then small doses of ipecacuanha may be given with benefit till the burden is thrown off. Two to four grains will usually suffice. Much more frequently the efforts of the bowels are not successful in carrying off their contents, and the stomach is at the same time so irritable as not easily to retain medicine. Then calomel is the great remedy. Whatever objections theoretical men may make to the use of so potent a drug for a tender infant, few practical men, after having tried it, are willing to treat this disease without this article. It is not offensive to the taste; it can be retained when scarce any other medicine can be; and, if vomiting follows a dose of it, the stomach becomes less irritable, so that a way is open for other medicines or for nourishment. By its operation the bowels are disburdened of their load with benefit. But it is a medicine which is slow in its operation, and castor oil may be used after it with advantage."

Unless the stomach is quite irritable, castor oil, syrup of rhubarb, or, if there is a state of acidity, rhubarb and magnesia, are generally sufficient to remove the indigestible substance. Dr. E. H. Parker prefers the syrup of rhubarb in such cases. If the stomach is irritable, so that the purgatives mentioned would be vomited, calomel is certainly the best medicine. This should not be given to the extent of more than one or two doses, and it may be aided by a simple enema.

If there is no indigestible substance in the intestines, purgatives should not be used, as they would then do more harm than good. If the disease has continued several hours, it is probable that any irritating substance, which might have been present at first, has passed from the bowels, and no purgative is required.

Treatment designed to diminish the frequency of the evacuations and improve their character, should be commenced at the earliest moment.

Every hour that cholera infantum continues unchecked reduces the strength of the infant and diminishes his chance of recovery. Our main reliance must be on opium in some form. Dr. Jackson truly remarks that we have no substitute for it. "From three to five drops of the tincture of opium," says he, "may be given, and the dose may be repeated in eight or twelve hours." This he recommends "after the bowels are unburdened."

It is better to give a smaller dose of opium and repeat it often. If laudanum is used, it may be given in one drop doses every two or three hours to a child one year old, its effect being watched. There is danger in this disease of the sudden supervention of stupor, amounting even to coma and ending fatally. In these cases the stools are generally suddenly checked, and the opiate might aid in producing this result. In a few instances which I can recall to mind, where death occurred in this way, the friends believed that the melancholy result was hastened by the medicine. If the evacuations are partially checked and there are signs of stupor, the opiate should either be omitted or given less frequently. Explicit and positive directions to this effect should be given. Eligible preparations of opium for this disease are paregoric, tincture of opium, pulv. cretæ comp. c. opio, and, if there is no irritability of stomach, Dover's powder.

Astringents and often alkalies are useful employed as adjuvants of the opiate. The chief danger is from the frequent watery evacuations, and both these remedies certainly aid materially in restraining them. Astringents are less tolerated by an irritable stomach than either opium or chalk, so that it is often advisable to discontinue their use when they are vomited, in cases in which they would be very beneficial if the stomach were retentive. The opiate and alkali may be employed in the following combination:—

℞. Tinct. opii gtt. xij;
Mistur. cretæ ℥iss. Misce.

One teaspoonful every two or three hours to an infant one year old. To this mixture an astringent may be added, as tincture of catechu or kino.

I prefer for ordinary cases, as it is astringent, alkaline, opiate, and anti-emetic, the powder of subnitrate of bismuth and chalk with opium, already recommended for intestinal inflammation.

By this mode of treatment the stools are generally in a few hours rendered less frequent and more consistent.

There are physicians who believe that calomel given in small and repeated doses has a beneficial effect in choleriform diarrhœa, but those who use it employ it in combination with opium, and it is probable that the good effect observed is largely due to the latter remedy. From the anatomical characters of cholera-infantum there is apparently no indication for a medicine that affects the function of the liver, and there is no evidence that calomel exerts any good effect on the follicular apparatus of the intestines, which, so far as we can localize the disease, seems to be most in fault of any part of the digestive apparatus. On theoretical grounds, therefore, I should oppose the employment of this agent, and my observations of its effects have been such that I entirely discard its use while we have other safe and efficient remedies to meet every indication.

Ordinarily, as the diarrhœa is relieved, the vomiting ceases. The opiate and alkaline remedies employed for the former are also curative of the latter; still the vomiting, if frequent and obstinate, sometimes does require special treatment, and there are no better anti-emetic mixtures than those recommended in our remarks on the treatment of intestinal inflammation. In robust infants at the commencement of the attack, small pieces of ice taken in the mouth aid in diminishing the irritability of stomach. Mustard should also be applied to the epigastrium.

In most cases alcoholic stimulants are required. The best of these is Bourbon whiskey or brandy, which should be used from an early period of the disease. Aside from its sustaining the vital powers, it aids also in relieving the irritability of stomach.

The diet in cholera infantum should be simple but nutritious. It should be given little at a time and often. If the infant nurse, it should be confined to the breast. If weaned, cold barley or rice-water should be given, with whiskey or brandy, in the first stages of the disease, and afterwards milk or broths may be employed in addition.

If cholera infantum end in inflammation, the treatment already described for that disease should be adopted.

CHAPTER XI.

INTESTINAL WORMS.

The belief has been prevalent in the profession, and is now in the community, that the presence of worms in the intestines constitutes a frequent disease in early life. As the pathology of infancy and childhood, and especially the means of diagnosticating diseases, are better understood, this idea is gradually abandoned by the profession. Still, intestinal worms must be considered an occasional cause of serious derangement or even disease, and of death also.

Worms, indeed, may exist in the intestines without any appreciable deviation in the individual from a state of health. Ordinarily, however, they in time give rise to symptoms so as to require the use of remedies for their expulsion.

There are five kinds of worms whose habitat is the human intestines, namely, the ascaris lumbricoides, ascaris vermicularis, or, as it is sometimes called, the oxyuris vermicularis, the trichocephalus dispar, and two species of tænia. The ascaris lumbricoides, when matured, measures from five inches to about a foot in length. Young ones are sometimes expelled not more than two inches in length. The color is a reddish-brown, with a shade of yellow. The dead worm has a paler color. The females are in numerical excess of the males, and their size is also greater. The worm in shape resembles the common earthworm, from which it derives the name lumbricus. It is, however, more pointed at both extremities than the earthworm, and the color is a paler red. The tail of the male worm is curved, while that of the female is straight. The mouth is triangular, and is surrounded by three tubercles.

The ascaris lumbricoides resides usually in the small intestines. It occasionally enters the stomach, from which it is vomited, or it crawls up the œsophagus into the fauces, from which it is soon removed by the efforts of the individual. Cases are on record, one of which Andral witnessed, in which the worm entered the larynx, producing suffocation and speedy death. M. Tonnelle also witnessed such a case. A child nine years old was suddenly seized with great difficulty of respiration and pain in the upper part of the chest. A careful examination of the thorax gave a negative result. Death occurred in from twelve to fifteen hours, and at the post-mortem examination a lumbricus was found filling the cavity of the larynx. M. Blandin, also, witnessed a case, when interné of the Hôpital des Enfants. An infant was suffocated by one of these worms, which had penetrated as far as the right bronchus. Very rarely they crawl from the fauces into the nasal passages. This worm is so strong and active, that there is no recess or reflexion of the mucous membrane of the digestive apparatus which it could possibly penetrate, in which it has not been found. It has been discovered in the appendix vermiformis, in the pancreatic duct, in the common bile-duct, and even in the gall-bladder. The number of these worms found in the intestines is very various. There may be only one, or the number may be almost incredibly large.

Thus, Barrier relates the case of an infant thirty months old, who died in Hospital Necker. It was believed to be tubercular. Numerous tumors, which could be felt in the abdomen, were supposed to be tubercular masses. On making the post-mortem examination, the mesenteric glands were found healthy, but the intestines throughout their entire extent were filled with lumbrici. The masses which, during life, were believed to be tubercular glands, were found to consist of worms. The cœcum, especially, was greatly distended by them. The intertwining or collection in balls of these worms constitutes, indeed, one of the chief dangers, as it renders them so much the more difficult of expulsion.

The round worm, as this worm is commonly called, possesses no organs of penetration, still, if the intestine is weakened by disease, especially by ulceration, it may, by pressure with its head, force an opening through which it escapes into the cavity of the abdomen, causing peritonitis and death. This worm is often found, whether single or in masses, surrounded with mucus, which serves as a partial protection to the intestines.

The portion of the mucous membrane in contact with lumbrici is often found inflamed, either from movements of the worm, or from pressure of a mass of worms, or even of a single worm in a confined position, as the appendix vermiformis. This inflammation, continuing and increasing, may end in ulceration, and thus a weakened spot be produced, which may be ruptured by simple pressure of the mouth of the worm. In this way are, probably, to be explained those apparent cases of perforation, which have led some observers to believe that lumbrici had actually the power of penetrating the healthy coats of the intestines.

M. Guersant describes a case in which the appendix vermiformis was found with an opening through which two lumbrici had partly passed into the abdominal cavity. The effect of their impaction in this narrow cul-de-sac was much like that of a bean or a seed lodged in the same situation.

Lumbrici are sometimes found in a most remarkable location, namely, in little abscesses, external to the intestines, situated generally in the abdominal walls. These, after a time, in certain cases, open externally, discharging pus, one or more worms, and perhaps a little excrementitious matter. They result from an opening in the intestine, through which the worm has passed, producing circumscribed inflammation and an abscess, and the intestine, now relieved of the irritant, heals before the abscess reaches the surface.

The mucous membrane in contact with the worm sometimes presents the natural appearance; in other cases, it is red, being evidently inflamed.

The ascaris vermicularis, or oxyuris vermicularis, or, as it is termed in the vernacular, the threadworm, is also frequent in childhood, and is the cause sometimes of much suffering, though generally of less dangerous symptoms than the round worm. Its habitat is the large intestine, commonly the rectum. Bremser states that he found it even in the cœcum. This worm resembles pieces of white thread, and hence its common name. The female is larger than the male, measuring about half an inch in length, while the length of the male is not more than two or three lines, and it is proportionately more slender. It exists often in vast numbers in the rectum, from which it is expelled with the excrementitious matter. The head of the worm is blunt, and is furnished with a transparent vesicle. The tail is very slender, terminating in a spiral in the male, while it is straight in the female. These worms multiply rapidly, and they move actively their anterior extremity. In girls they sometimes enter the vagina, producing a leucorrhœal discharge.

The trichocephalus dispar, or the long threadworm, is also found in the large intestine, but oftener in the caput coli or ascending colon than elsewhere. It measures in length one and a half inches, sometimes even two inches. The anterior two-thirds are slender, resembling in size and appearance a hair, whence its name trichocephalus. The posterior third is considerably larger than the anterior, being, like the ascaris vermicularis, spiral in the male and straighter in the female. The worm is of a light color. Children are less frequently affected with the trichocephalus than with the two kinds just described. It rarely, if ever, produces any symptoms or does any appreciable injury.

The tænia, or tapeworm, is much less frequent than the round or threadworm. There are two recognized species, the tænia solium and tænia lata. These worms have minute heads, which are different in the two species. Their bodies consist of white flat segments, which are united in a different manner in the two species. These segments near the head are small, as if rudimental, but as the distance from the head increases they enlarge, till their full dev[illegible]l. They are quadrilateral, having, when [illegible] length than breadth in the tænia s[illegible]th in the tænia lata.

[illegible], each segment containing the reproductive organs complete. The oviduct opens in the centre of the flat surface in the tænia solium, upon the edge of the segment in the tænia lata.

The tænia attains a great length, but its maximum of growth is not ascertained, as pieces are generally detached and expelled from time to time before the removal of the entire worm. The tænia lata is supposed to attain the length of about fifteen feet. The tænia solium is considerably longer.

The tænia is rare in early life, but cases now and then occur. I have met but one case in this city under the age of five years. Rosen and Bremser report cases between the ages of six and eleven years, and Hufeland, one at the age of six months. Wawruch collected 206 observations of tænia, in 22 of which the age was less than fifteen years; the youngest was a girl of three years. A most remarkable case of tænia is reported in the *Gazette Médicale* of Paris in 1837. M. Muller was called to treat a foster child five days old for slight constipation. The bowels were evacuated by the use of rhubarb, manna, and a few grains of salt, and in the excrement a foot and a half of tænia were discovered. This worm had evidently existed during the fœtal life of the infant.

A similar case was treated by Prof. Skene, in the Long Island Hospital, in September, 1871, and reported by Dr. Armor in the *New York Medical Journal.* The infant was born, September 3d, of a hearty Irish servant girl. On the 7th it refused to nurse, and was observed to have a mild form of tetanus. On the 8th small doses of calomel having been given, followed by castor oil, two segments of a tænia solium were passed from the bowels, and on subsequent days ten more segments, after which the tetanus ceased. The remedies employed after September 8th were the oil of male fern and turpentine. The mother, who had presented no symptoms of tænia, was ordered an emulsion of pumpkin-seeds, which "she faithfully took for twenty-four hours, at the end of which she passed over seventy segments of tænia." This case is interesting as throwing light on a possible mode of the production of tænia, quite different from the ordinary and recognized mode, and also as showing the causative relation of intestinal worms to tetanus infantum.

CAUSES.—The vermicular disease is much more common in one locality than another. Thus, in Paris there are few cases, while in the provinces of France and many other parts of Europe it is a common affection. It is more common in this city among the children of the poor than those in the better walks of life.

In the same region, with an identity of regimen, pursuits, and habits, it is sometimes common in one season, and rare in another. It is an interesting fact, also, as showing the influence of local causes, which we often cannot appreciate, that, in countries where the disease prevails, the relative frequency of the different kinds of worms is often different. Thus, in England, Holland, and Germany, the tænia solium is common, and the tænia lata rare, while the reverse is true of Russia, Poland, and Switzerland.

There is often some derangement or disease of the digestive system, which is favorable for the growth of intestinal worms. In cases of continued indigestion, accompanied by irritation or subacute inflammation of the mucous surface, with an excessive secretion of mucus, worms are apt to be generated, which aggravate the primary affection. Children in the last stages of typhoid fever not infrequently pass lumbrici in the evacuations from the bowels.

It has long been a common and correct belief that the use of certain kinds of food favors the development of worms. Fruits in excess, food of an inferior quality, or but partially cooked, remaining an unusual time unassimilated in the intestines, afford a nidus in which worms are very apt to appear. The same may be said of saccharine substances, taken in too large quantity or too frequently. An excess of food, even of good quality, is also a cause, since this gives rise to the predisposing condition of undigested nutriment in the intestines. The period of childhood is mentioned by writers as one of the predisposing causes. Both the round and threadworms occur oftenest in children between the ages of three and ten years, but they are not very infrequent at any age between the first year and puberty.

I have witnessed a large number of autopsies of infants in the institutions of this city, and, although the intestines in a large proportion of them were examined, I can recall only one instance in which intestinal worms were present when death had occurred in the first year. This immunity is, however, in great part attributable to the simple diet of these institutions. The infrequency of worms in the first year of life is an important practical fact. The immunity is greatest, for obvious reasons, in those who are nourished entirely or almost entirely at the breast.

In this city, children of the poor, living in almost total disregard of sanitary requirements, are especially liable to worms. This is attributable not only to the character of their food, which is often of inferior quality and poorly prepared, but also to the filthy and insalu[illegible] the domiciles and streets in which they reside, and the consequent cachexia. One of the older writers remarks that intestinal worms, like confervoid growths, thrive best where it is filthy and dark. Though such analogical reasoning is not to be accepted, the fact remains of the great liability to worms of those children who reside in insalubrious and humid localities which are favorable also for cryptogamic vegetation.

SYMPTOMS OF LUMBRICI.—These are in part constitutional or sympathetic, and in part local, due to the mechanical effect of these entozoa on the coats of the intestines. Writers, especially Rilliet and Barthez, have described the symptoms supposed to indicate lumbrici with minuteness. Those of a constitutional or sympathetic character are the following: Features sometimes flushed, sometimes pallid, and sometimes of a leaden hue; lower eyelids swollen, and sometimes surrounded by a blue semicircle; thirst, nausea, or even vomiting; appetite diminished, or entirely lost, or, on the other hand, augmented; breath foul; papillæ of the tongue red and projecting; pulse accelerated and irregular. Rilliet and Barthez state that they observed this irregularity in a boy three years old, at the time he was passing a large number of lumbrici. The irregularity afterwards disappeared. Acceleration of the pulse is one of the most common symptoms of these worms. The popular idea of "worm fever" has indeed a foundation in fact. This fever is often remittent and mild, but occasionally it is continuous and intense.

The symptoms pertaining to the nervous system are important. In mild cases they may be absent, as when there are few lumbrici, and the child is robust, and over the age of five years, but in severe cases more or fewer of these symptoms are commonly present. They are dilation of the pupils, especially inequality of dilation, to which Munro attached diagnostic value; strabismus, twitching of the muscles, clonic convulsions, somnolence, headache, neuralgic pains, delirium. Rarely chorea, deafness, and paralysis, it is believed, may result. (M. Bouchut, *Gaz. des Hôpitaux*, 1867.) Hyperæsthesia of the abdominal surface was present in a case which I attended, and which subsided as soon as the lumbrici were expelled. Grinding the teeth in sleep, and picking the nostrils, are symptoms to which families attach great value. Observations, however, show that, though sometimes due to worms, they more frequently have another cause.

The local symptoms or disorders, in other words those having a mechanical origin, are colicky pains, experienced chiefly in the umbilical region; in some patients, simple non-inflammatory diarrhœa; in others, enteritis; and in others still, colitis; stools sometimes natural; in other cases, liquid but fæcal; and in others still, muco-sanguineous; flatulence. M. Davaine, at a recent period, made the important discovery that the fæces of patients affected with worms contain the ova of the particular species present, in large numbers. The ovum of the lumbricus is oval and granular, while that of the trichocephalus is spherical, with a small projection at each end, those of the threadworm oval and irregular, and those of the tænia round. These ova can be seen through a lens magnifying 150 diameters.

In exceptional cases, there are local symptoms due to the presence of worms in unusual situations, such as a crawling sensation in the œsophagus; a sense of constriction in this tube or the pharynx; nausea and vomiting; a cough, especially if the worm has crawled to the upper part of the œsophagus; rarely the most urgent dyspnœa, and probable suffocation, if a lumbricus has entered the larynx.

The enteritis and colitis, to which these worms sometimes give rise, is ordinarily mild, but in rare instances ulceration occurs, which may be attended by profuse and even fatal hemorrhage. Occasionally very painful and dangerous constipation results from an accumulation of worms, in a ball or mass, too large to be expelled, unless with much delay and suffering, preventing the passage of fæcal matter, and producing severe abdominal pains. The symptoms in these cases resemble closely those of intussusception. A marked example of constipation produced in this way occurred in a family with whom I am acquainted, and who then resided in the interior of this State. A little girl of three or four years was suddenly affected with obstinate constipation. The physicians prescribed active purgatives, calomel among others, and finally croton oil, and various injections, without relief. There was great pain, with distension of the abdomen, and death seemed inevitable, when, after the lapse of several days, a free evacuation occurred, and in the stool was a mass of worms firmly intertwined.

Children often have lumbrici without any appreciable impairment of the general health, but their presence may intensify the symptoms of intercurrent diseases, and greatly increase the danger. Thus, I recollect two children of three and three and a half years, with pneumonitis, who, at the same time, had lumbrici, one passing in the course of a few days thirty and the other twelve of these entozoa. Both presented well-marked physical signs of pneumonitis, and, though they recovered, the febrile movement and nervous symptoms were apparently aggravated by the intestinal affection. One had convulsions in the commencement of the inflammation, followed by profound stupor and amaurosis, lasting two or three days.

Often the symptoms due to lumbrici coexist with those of a protracted and distinct intestinal disease. Thus, as we have seen, the intestinal secretions of typhoid fever and of chronic diarrhœal maladies afford a nidus for the growth of worms, and accordingly, at an advanced stage of these diseases, lumbrici are common.

The symptoms produced by the *ascaris vermicularis* are somewhat different. These worms do not usually cause the fever, disturbed digestion, the colicky pains, or the dangerous nervous symptoms which arise from the presence of lumbrici. Nor do they, like lumbrici, endanger life by crawling into unusual situations. Convulsions have been attributed to them, but such a result is exceptional, if, indeed, the cause was rightly assigned.

The most common symptom produced by the ascaris vermicularis is an intense itching of the anus. This is most intense at night when the child is in bed. It is sometimes absent during the day, but it returns so regularly at night, from the increased activity of the worm, that it has even been mistaken for a periodical nervous affection, and treated as such by quinine. So eminent a physician as M. Cruveilhier confesses that he has made this mistake. The itching sometimes leads to onanism, and in the female child the ascaris occasionally passes from the rectum to the vagina, where it gives rise to leucorrhœa.

The trichocephalus dispar and the tænia are so rare in childhood, that few physicians ever meet a case. The trichocephalus is said by some to produce no symptoms. The symptoms due to tænia in children are not different from those in the adult.

Diagnosis.—Bremser long since made the remark, and it has been repeated by most writers on diseases of children, that there is no sign or symptom which affords positive proof of the presence of intestinal worms, except the expulsion of one or more. Late microscopic investigations have revealed, however, a pathognomonic sign, namely, the presence of ova in the fæces, which indicate not only the nature of the disease, but the species of the worm.

The symptoms and disorders produced by lumbrici may all occur from other causes. Still, if several of them are present, and a careful examination discloses no other cause, the presence of worms should be suspected, provided the child is over the age of two years. The microscope may then be used for diagnosis. A little tentative treatment, entirely safe to the child, will also determine whether the suspicion is correct. One or two doses of medicine, administered under such circumstances, like the surgeon's exploring needle, may reveal the nature of the disease, and indicate the means of cure.

In case of the ascaris vermicularis, the itching directs attention to the anus as the place of the disease, and here the offending entozoa may often be discovered by the eye.

Prognosis.—Intestinal worms produce a fatal result in only a small proportion of cases. The ascaris vermicularis never proves fatal, unless in rare instances, through convulsions. The manner in which death may be produced by lumbrici has already been pointed out.

In general, when the nature of the disease is ascertained, the worms are readily expelled by treatment, and the patient restored to health. If then there is no complicating disease, the prognosis is good.

Treatment.—Much injury has been done to children by the use of anthelmintics occasionally employed by physicians, but oftener by parents before the physician is called. Medicines of this kind are usually irritants, and, in many of those diseases which simulate the verminous affection, but are distinct from it, there is already an irritated if not an inflamed state of the intestinal mucous surface.

Vermifuges administered under such circumstances obviously do harm, and in all acute diseases in which they are not required, even if their action is harmless, their employment is to be regretted, since it consumes time which is very precious. It is thus that many lives are lost by the use of anthelmintic nostrums, which are extensively advertised and which command a ready sale, since the belief in the presence of worms as a frequent cause of disease pervades all classes of the community.

A safe rule, followed by many physicians, and it would be much better if it were general, is not to give anthelmintics unless the child has passed one or more worms, or their ova are found in the fæces, and not then if the symptoms seem to be referable to a co-existing disease. In doubtful cases in which the symptoms resemble those of worms, a purgative dose of calomel or calomel and rhubarb may be employed. It will generally bring away one or more lumbrici or a mass of ascaris vermicularis, if either species of entozoa is present. This purgative may be safely employed if there is no previous diarrhœa or debility. If after one or two doses and a free purgation no worms are passed, anthelmintic remedies should not be given, for it is almost certain that no worms exist.

A large number of medicines have, or have had, a reputation as anthelmintics. Santonin, the active principle of the European wormseed, is one of the best, and is much employed in this country and in Europe. It is nearly tasteless; it may be given in powder, spread on bread with the butter. It is kept in shops in one or two grain lozenges, with and without calomel. It has the advantage of easy administration, and is destructive to both the round and threadworm. M. Bouchut considers it preferable to all other remedies in the treatment of the round worm. "To children two years of age he administers it in doses of ten centigrammes (2.30 grains), and in patients above this age, the quantity is increased by five centigrammes (1.15 grains) for every additional year." He gives in addition occasional doses of calomel or castor oil. In this country santonin is usually administered in one to three grain doses, two or three times daily, with an occasional purgative. The purgative is required to aid not only in the expulsion of the worm but also of the ova. In overdoses santonin causes vomiting, diarrhœa, and altered vision, so that objects appear yellow, but in medicinal doses it produces no unpleasant consequences. Other medicines are preferable if there are symptoms of enteritis. For many years the anthelmintic most employed in this country was the pinkroot, the root of the *Spigelia marilandica*, an indigenous plant. It was not only prescribed by physicians, but employed by families as a domestic remedy. It is apt to cause, if the dose is large, cerebral symptoms, as vertigo, dimness of sight, spasm of the facial muscles, stupor, and even convulsions. These effects less frequently occur if the pinkroot is given with a purgative, and it has been customary to administer it in combination with senna in an infusion. A half ounce of spigelia with an equal quantity of senna is macerated for two hours in a pint of boiling water, and then strained. For a child two or three years old, the dose is half an ounce to one ounce. So popular has this vermifuge been in this country, that probably a majority of the native-born adults in the States recollect the nauseating doses of pinkroot administered by anxious parents. Pharmacy now provides us with the same medicine in a more convenient and acceptable form, that of the fluid extracts.

℞. Fluid ext. spigel. f℥j;
Fluid ext. sennæ f℥ss. Misce.
One teaspoonful to a child from three to five years.

The officinal fluid extract of spigelia and senna may be given in the same dose. Prof. Proctor recommended the addition of santonin to this extract.

℞. Fluid ext. spigel. et sennæ f℥;
Santonin gr. viij. Misce.

This is probably the best anthelmintic that can be employed for the destruction of the round worm in uncomplicated cases, and it is also very useful in treating the ascaris vermicularis. Chenopodium is also a good anthelmintic. It is efficient, and at the same time one of the safest in case the mucous membrane is inflamed. If there is abdominal tenderness, with stools too frequent, and thin, or mucous, and tinged with blood, I should prefer the chenopodium to most of the other vermifuges. To a child of three years five drops of the oil may be given three times daily. It may be continued for a longer period than would be safe for most of the other vermifuges. Twice a week, during its use, a mild purgative should be given, as castor oil, rhubarb, or magnesia, unless the bowels are open. It may be given dropped on sugar or in a mucilaginous mixture.

Dr. J. F. Meigs says: "I myself rarely give any other remedy than *wormseed oil* in slight and especially in doubtful cases, unless this has already been tried and failed. From my own experience, I believe that this remedy is all-sufficient in a large majority of the cases that occur in this city, as these are almost always of a mild character, and as it not only produces the expulsion of the parasites when they exist, but also acts beneficially upon the forms of digestive irritation which simulate so closely the symptoms produced by worms. I am persuaded, indeed, that of all the cases that have come under my notice, in which it seemed probable that worms might be present, none were expelled in nearly half, and yet the signs of disturbed health have passed away under the use of the remedy." . . . . "The following is a very good formula for the administration of this remedy:—

"℞. Ol. chenopodii gtt. lx vel ʒj;
P. g. acaciæ ʒij;
Syrup. simplic. ℥j;
Aq. cinnamom. ℥ij. Misce.

Give a dessertspoonful three times a day for three days, and repeat after several days."

In cases of protracted intestinal disease attended by an increased and vitiated secretion from the mucous surface, a state which often gives rise to worms, turpentine is one of the best anthelmintics.

In fact, in some of these cases, there is no good substitute for it. For example, a boy of about ten years, attended by myself, October, 1864, had reached or nearly reached the fourth week of typhoid fever, when he passed from his bowels a large quantity of blood. He was previously emaciated and weak, and there had been, as is usual in such cases, considerable diarrhœa. The hemorrhage was attended with great prostration, from which, however, he partially rallied by the use of stimulants. On the following day an equally severe hemorrhage occurred, attended with coldness of the face and extremities and great feebleness of pulse, so that death appeared imminent. Turpentine was now administered every six hours, a few lumbrici were passed, and the case thenceforth progressed favorably. The mechanical effect of the lumbrici on the ulcerated surface of intestine had probably given rise to the hemorrhage. Turpentine may be given in doses of from five to ten minims three times daily to a child five years old. Sweetened milk or sugar in powder is a good vehicle for it, or it may be given in a mucilaginous mixture.

℞. Spts. terebinth. rect. ʒij;
Ol. limonis gtt. v;
Mucil. gum acac.,
Syr. simplic., āā ʒvj;
Aq. anisi ℥j. Misce.
Dose, one teaspoonful every six hours.

The following formula for the employment of this agent is recommended by Dr. Condie:—

℞. Mucil. gum acac. ℥ij;
Sacch. alb. ʒx;
Spir. æther. nitr. ʒiij;
Spir. terebinth. rect. ʒiij;
Magnes. calcinat. ℈j;
Aquæ menthæ ℥j. Misce.

It is useless to enumerate the many anthelmintic mixtures which have been extolled from time to time. Those mentioned above are the least nauseous, and will rarely disappoint the practitioner. One other antidote for the round worm should be mentioned, as it has been much used and is efficient, namely, cowhage. This consists of the bristles which cover the pods of the *Mucuna pruriens*, a tropical plant. The pods are dipped in plain syrup of the ordinary consistence, and the bristles are scraped off with the syrup. When enough of the medicine is added to render the syrup of the consistence of thick honey, it is ready for use. The dose is a teaspoonful every morning for three days, after which a cathartic should be administered. I have never prescribed cowhage, although it is not unfrequently ordered by physicians, and a popular nostrum consists chiefly of it.

Threadworms require different treatment. The anthelmintics described above have less effect on them than on the lumbrici. Still, they may be administered for the expulsion of the former, but rather as adjuvants to the main treatment. The main treatment should be local, consisting in the use of injections, since from the habitat of this worm enemata will ordinarily reach and destroy it. The substances which have been successfully employed as enemata are salt and water, lime-water, a decoction of aloes, or a decoction of two cloves of garlic in milk. West recommends the injection of six ounces of lime-water and two drachms of tincture ferri chloridi. Trousseau uses a solution of the arsenite of soda.

℞. Sodæ arsenit. gr. j;
Aq. destillat. ℥xij. M.
For six enemata, one or two daily.

Cold injections are more effectual than warm, and even a daily injection of cold water has sometimes been found sufficient to effect a cure with proper internal remedies.

Threadworms in the rectum may also be destroyed by ointments containing mercury, as a drachm of mercurial ointment mixed with oil or melted butter, or five grains of calomel with the yelk of an egg. (Bouchut.) After the expulsion of the worms patients often require tonic treatment. In the treatment of tænia in children the pumpkin-seed is a safe and efficient remedy, and is the one now commonly employed.

CHAPTER XII.

GASTRO-INTESTINAL HEMORRHAGE.

HEMORRHAGE from the capillaries is more frequent in infancy than at any other period of life, whether in consequence of the irregularity of the circulation and frequent congestions in the infant, or the greater delicacy and feebleness of the minute vessels at this age. Hemorrhage, generally capillary, from the gastro-intestinal mucous surface, occurs sufficiently often in the child, and especially in the infant, to render it a disease of some importance. It is more frequent the younger the individual.

This hemorrhage occurs in three distinct first, in the new-born infant from causes not fully ascertained; secondly, from a pathological state of the blood or the vessels in which it circulates, and which is often connected with purpura hemorrhagica; thirdly, from a local cause.

First Variety.—In 49 cases, which I have collected from different writers, the hemorrhage occurred in 38 under the age of six days, in 5 from six to ten days, and in 6 from ten to twenty days. Some authors cite cases which occurred at the age of several weeks, but hemorrhage into the intestines at so late a period cannot be due to any cause operating at birth, and it is proper to consider such as examples of one of the other varieties.

Passive congestion of the gastro-intestinal mucous membrane is not infrequent in the new-born. Billard speaks of twenty-five cases without hemorrhage which he has examined. This anatomical state of the mucous membrane of the intestines, whether occurring as part of a general plethora or being simply a local affection with no hyperæmia of other parts, evidently requires only a certain increase and hemorrhage inevitably results.

The cause of the abnormal congestion of the gastro-intestinal mucous membrane, so common in the new-born, has been referred by writers to the previous health of the parents, to circumstances attending the birth, especially too prompt a ligature of the cord, to irritant matters in the intestines, to external violence, and to the two opposite extremes, namely, a plethoric and a feeble state. In my opinion, the chief cause, in many cases, is the tardy or incomplete establishment of the respiratory and circulatory functions, which gives rise to congestion in the cavities of the heart and in the lungs, and, consequently, in the capillaries of the systemic system. Evidently, this congestion is most intense in the full-blooded. Billard says, of fifteen cases of intestinal hemorrhage which he examined, most of them were remarkable for the plethoric condition of their bodies and the general congestion of their integuments. Some, on the contrary, were pale and feeble, as is common after abundant hemorrhage.

In two infants who died soon after birth, and whose bodies I subsequently examined, there was apparently a plethoric state, which rendered the fatal result more certain, if it did not, indeed, produce it. In *one* of these, in addition to intense general congestion, meningeal apoplexy had occurred, although the birth of the child had been easy.

It is not difficult to understand in what way too speedy a ligature of the cord may be a cause of capillary congestion and hemorrhage. At the moment of birth, the uterus is contracted, the placenta compressed, and, if the cord is now tied, more blood remains in the vessels of the infant than if tied a little later. A little later, in consequence of the temporary cessation of uterine contractions, and the re-establishment of circulation in the infant, blood flows through the cord towards the placenta. The cord thus acts as a safety valve to the circulation. Any accoucheur who will take pains to witness the effect on the cord of the return of circulation, will observe what I have stated. Too speedy a ligature of the cord would not, however, be sufficient in the majority of cases to produce that amount of plethora which would give rise to intestinal hemorrhage without other co-operating causes.

Tardy or incomplete establishment of respiration and circulation, which gives rise to intestinal congestion and hemorrhage, may be due to disease of the heart or lungs, as atelectasis or cyanosis, to feebleness of the infant, or to slow and difficult birth. In a large proportion of cases, however, the birth is easy. Thus, three of five patients with intestinal hemorrhage, who were treated by M. Gendrin, were born of an easy labor, and the same was true of four infants observed by M. Kiwisch.

The *second* variety of gastro-intestinal hemorrhage often occurs as a sequel of other and debilitating diseases. I have known it to occur as a sequel of measles, smallpox, scarlet fever, and in one case of typhoid fever. One of these patients, when apparently the period of danger was passed, began to lose blood from nearly all the mucous surfaces, from the nostrils and gums, as well as intestines, and the case, which but for the hemorrhage would doubtless have had a favorable issue, terminated fatally in less than a week.

Patients with this variety of gastro-intestinal hemorrhage sometimes present the maculæ of purpura, and commonly their aspect is pallid and cachectic. The following was a fatal case of hemorrhage occurring from the ileum, in a mild form of purpura hemorrhagica:—

CASE.—An infant, eight months old, of healthy parentage, nursing, with no previous sickness, and fleshy, vomited a small quanty of blood on the 25th of March, 1865; soon after it passed a stool consisting of almost pure blood. On the following day five or six patches of purpura hemorrhagica were observed on the arms and legs. These maculæ continued till death. There was no more hæmatemesis, but the stools, which were from two to four daily, consisted largely of blood. Death occurred from exhaustion on March 31st.

Sectio Cadaver.—Head not examined; thoracic organs healthy, but pale; liver fatty; stomach, upper part of small intestines, and entire colon of normal appearance, unless presenting a somewhat lighter color than the healthy intestine from deficiency of blood; mucous membrane in the ileum to the extent of several inches, intensely injected without thickening. The blood had obviously escaped from this portion of the intestine, and a moderate amount of this fluid was found in the tube below the point of vascularity. This case is interesting not only on account of the development of purpura hemorrhagica, but the subsequent melæna in a nursing child, apparently of healthy parentage, and without previous sickness.

In our remarks on internal convulsions, the case is related of a scrofulous infant who, to all appearance in her ordinary health, suddenly became affected with intestinal hemorrhage in connection with external and internal convulsions. A point of interest in this case was the relation of the hemorrhage to the neurosis. In one of the three cases of intestinal hemorrhage described by West, there were also convulsions. In rare instances there is an hereditary hemorrhagic diathesis to which the melæna is attributable. In the *New York Journal of Medicine and Surgery*, July, 1840, Prof. Swett relates the history of a hemorrhagic family. Seventeen out of eighteen children of this family had died of hemorrhage of one form or another, and the survivor had epistaxis and melæna.

In the *third* variety, among the local causes producing hemorrhage may be mentioned ulceration as in typhoid fever, or in severe intestinal inflammation, the mechanical effect of solid substances, lumbrici, invagination, obstruction to the portal circulation, polypus of the rectum. Occasionally at the post-mortem examination of young infants I have found blood with mucus in the duodenum and jejunum, these portions of the intestines being at the same time intensely congested. In one case of protracted entero-colitis occurring in the summer season, I found many small circular ulcers in the colon, nearly all containing points of extravasated blood. Such are the principal local causes of hemorrhage from the bowels. Ordinary colitis may also be considered a cause, although the amount of blood evacuated in this disease is commonly small.

Of the three forms of intestinal hemorrhage described above, that arising from local causes is most frequent, while that occurring from a purpuric or hemorrhagic diathesis is least frequent. In rare cases fatal intestinal hemorrhage may occur in the newborn, and the blood be retained in the intestine, or if passed it may so closely resemble the meconium that its true nature is not discovered. M. Bednar relates the following case (*Krankheiten* *der Neugebornen*): "On the eleventh day after birth the boy's skin (then of a pale yellow color) diminished in warmth, the impulse of the heart became dull and prolonged, the respiratory murmur scarcely perceptible. The child lay almost motionless and slumbering. The day following the surface could scarcely be kept warm, and the little patient had to be aroused to suck. On the twentieth day after birth it died. The brain was found to be anæmic, the lungs plethoric, whilst blood was effused into the duodenum and stomach."

Melæna is more frequent than hæmatemesis. The hemorrhage, except when produced by a local cause, is usually from the small intestines. The blood, unless it comes from a point near the anus, as the rectum or descending colon, is commonly dark, and sometimes partially decomposed, emitting an offensive odor. Admixture of the blood with the intestinal secretions prevents coagulation of the fibrin.

Gastro-intestinal hemorrhage in itself produces few symptoms aside from the prostration which attends all hemorrhages. The disease with which it is associated may give rise to many and severe symptoms.

PROGNOSIS.—The result in the first and second varieties is much more unfavorable than in the third. Many new-born infants affected with gastro-intestinal hemorrhage die, but some recover. Billard attended fifteen fatal cases. It is probable, however, that death in the first variety is often due more to some coexisting lesion, than to the intestinal hemorrhage. Meningeal apoplexy, and the incomplete establishment of the circulatory and respiratory functions, may both operate as direct causes of death in this variety.

In the second variety, also, a very guarded prognosis should be given; so great a change in the circulatory system as to cause rupture of the capillaries, or transudation of blood in the ordinary course of the circulation, is a serious state. When this hemorrhage occurs as a sequel of the eruptive fevers, or in purpura hemorrhagica, the patient is more apt to die than recover.

In the third form of intestinal hemorrhage, the result depends on the nature of the cause, whether it is susceptible of removal. The majority of cases in this variety recover.

TREATMENT.—Billard recommends, as a means of preventing capillary congestion and hemorrhage in the new-born, to allow a little blood to escape from the umbilical cord before its ligation, if the establishment of respiration and circulation is difficult or incomplete. This relieves the hyperæmia of the internal organs and facilitates the flow of blood. After the commencement of internal hemorrhage and the appearance of bloody stools, the same may be done if plethora is indicated by the florid and robust appearance of the infant, and the cord is not too much shrivelled.

The treatment, both therapeutic and regimenal, of intestinal hemorrhage should vary according to the age and state of the infant, the profuseness of the hemorrhage, and the nature of the cause. Perfect quietude, in the recumbent position, is requisite in all severe cases. Derivation to the extremities should be procured in the young infant, by heated dry flannel or flannel wrung out of hot water; in the older infant, by the same, with the addition of mustard. The nursing infant should remain at the breast, being allowed, perhaps, in addition to the breast milk, a little cool barley or gum-water. Spoon-fed infants should be given food of the blandest quality, in the liquid form and cool. This is the proper diet, whatever the age, in the commencement of the hemorrhage. If there are evidences of exhaustion, cool beef-tea, or essence, and alcoholic stimulants, are necessary. It has been advised, in certain forms of intestinal hemorrhage, to apply leeches over the abdomen or around the anus. This treatment would, in my opinion, rarely be useful, but, on the contrary, in most cases, injurious. Hemorrhage from a mucous surface, when once established, will generally quickly relieve the local hyperæmia, and leeching, unless very cautiously employed, would promote the prostration, in which the real danger in this disease consists. On the other hand, moderate counter-irritation over the abdomen may be attended with real benefit as a derivative.

The therapeutic treatment consists mainly in the use of astringents. Of the mineral astringents, acetate of lead and nitrate of silver have been used, but the liquor ferri subsulphatis is preferable to all other astringents in hemorrhage from the stomach and upper part of the small intestine, but it is believed to be decomposed in its passage through the intestine, so that it has less astringent or styptic effect in the lower bowel than gallic acid. It may be given to a child five years of age, in doses of three or four drops in sweetened water or in mucilage.

Astringent enemata are sometimes useful. M. Rilliet treated a case which recovered with enemata, each containing twelve grains of extract of rhatany, a strong decoction of the same astringent being applied externally to the abdomen. M. Bouchut recommends "cold water externally to the abdomen, internally by the mouth, or by enemata frequently repeated. These enemata should be composed of two or three large spoonfuls only. They may be rendered more active with three grains of tannin, or with seven grains of the extract of rhatany, or seven grains of catechu, or, lastly, with one grain of nitrate of silver. In this latter case, a small glass syringe and distilled water must be used, to avoid the premature decomposition of the medicine."

In the hemorrhage occurring in purpura, or after exhausting constitutional diseases, tonics should be given in addition to astringents. In chronic inflammatory disease of the intestinal mucous membrane, attended by a vitiated secretion of the follicles, the hemorrhage may be best treated by turpentine. I have elsewhere related two cases of recovery by the use of this agent, in one of which (typhoid fever) lumbrici were expelled.

If the hemorrhage is due to a local cause, as lumbrici or a rectal polypus, the treatment obviously should consist in the removal of this cause.

CHAPTER XIII.

INTUSSUSCEPTION.

Intussusception, or the passage of one portion of intestine into another, has long been known as an occasional accident. Hippocrates, though debarred from the study of morbid anatomy, appears to have had a pretty clear idea of this lesion, and his practical mind suggested a mode of treatment which has been employed till the present time.

Intussusception without Symptoms.

This is not properly a disease. It consists in a displacement without any other anatomical change. There is, therefore, no obstruction, inflammation, or even congestion present, and no symptoms. This form of invagination might ordinarily be reduced by the normal peristaltic and vermicular movements of the intestine.

Invagination of a portion of the small intestine into the part immediately below it is often observed at the post-mortem examination of young infants, who had presented no symptoms due to the displacement. The invaginated mass is usually from half an inch to two inches in length, and, as a rule, this accident is multiple.

There may be ten or more distinct intussusceptions, at distances of a few inches from each other. This simple displacement is believed to occur ordinarily at or a short time prior to the moment of dissolution. It has been supposed to be most frequent in those who have died of cerebral or spasmodic diseases, but its occurrence is not unusual in other pathological states. I have often found it at the post-mortem examination of infants who have had subacute or chronic entero-colitis. Hevin states that he has seen it at the Salpêtrière over three hundred times. Billard has seen it especially in infants who have been subject to constipation. Any irritant, mechanical or other, which disturbs the regular movements of the intestines, doubtless may produce it. We learn, from good authority, that it can be caused in the rabbit by irritating the anus. It is, therefore, probable that the thread as well as round worm, by the irritation mechanically produced, may be a cause.

It is not improbable that simple intussusception occasionally occurs temporarily in children whose health remains good, when the regular movements of their intestines are disturbed by irritating ingesta or other causes. This form of displacement never takes place in the large intestine. Its usual seat is the lower part of the jejunum, and upper part of the ileum. As it possesses little interest as regards pathology, and none whatever as regards symptomatology and therapeutics, it may be ignored in our description of intussusception.

Intussusception with Symptoms.

Intussusception, or invagination, is one of the most painful and dangerous of human maladies, but fortunately not of frequent occurrence. I possess the records of fifty-two cases, which are tabulated in the Appendix (F); and from which the principal facts contained in this paper are derived. The patients were under the age of twelve years. The statistics furnished by these records, therefore, relate to both the periods of infancy and childhood.

Previous Health.—In thirty-four of the fifty-two cases, the state of the health previously to the invagination was recorded. From the following table it is seen that half, or seventeen, were previously well, the remaining half suffering from some disease or derangement:—

	Previous Health.	
Age.	Good.	Disease or Derangement.
One year or under	15	8
Over one year	2	9
	17	17

MM. Rilliet and Barthez, whose views in reference to intussusception are derived from the examination of the records of twenty-five cases, state that the previous health is ordinarily good, and the disease is, therefore, primitive. Their remark, according to the above statistics, is seen to be correct as regards patients under the age of one year, but incorrect for those over that age.

Most of the seventeen who had previous ill-health had diarrhœa, dysentery, or constipation, or diarrhœa alternating with constipation. Of those otherwise affected, one had threadworms, two obscure abdominal pains, one nausea and vomiting, and one four months old had symptoms of invagination, at the age of ten weeks, which soon passed off. It is seen that the pre-existing affections were ordinarily such as would be likely to accelerate the movements of the intestines and at the same time render them irregular.

Causes.—The above statistics, therefore, show that in a pretty large proportion of cases of intussusception, there is previous disease of the intestine or derangement of its function. This, doubtless, is a cause of the displacement in at least a certain proportion of cases. It is proper to attribute a causative relation to the diarrhœal maladies and constipation, inasmuch as they have been found to precede the displacement in so many instances. From the records, it is probable that invagination with symptoms, as well as the simple form, as already stated, may be caused by the irritation of intestinal worms. They were present in three of the fifty-two patients, though two of these seemed perfectly well till the occurrence of the intussusception. The other patient, immediately prior to it, complained of soreness around the anus, and ascarides were found on examination.

The use of irritating and indigestible food is regarded by writers as an occasional cause. Thus, some who have had intussusception have been in the habit of taking fruits, candies, and pastries freely. Such ingesta may be an immediate cause by their irritating effect, or a remote cause giving rise to diarrhœa, which, in turn, produces intussusception.

Rilliet and Barthez consider the sex a predisposing cause. There are more male than female children affected with intussusception. Of the twenty-five cases collated by them, all but three were boys. In our own collection, the sex of thirty-four of the patients was recorded, and of these twenty-three were boys.

In rare cases external violence is the only apparent exciting cause. One patient (No. 37, Appendix) received a severe contusion of the abdomen two years before death, and from this time continued to complain at intervals of pain in the bowels. One writer also mentions the case of a child nine years old who received a blow from a comrade at school, and from this time had alternately diarrhœa and constipation till the invagination commenced. Rilliet and Barthez also relate the case of two children who were taken suddenly with invagination when their parents were tossing them in their arms.

AGE.—Of the fifty-two cases embraced in our statistics, the ages were as follows:—

3 were 3 months old.
12 “ 4 “ “
3 “ 5 “ “
5 “ 6 “ “
1 was 7 “ “
1 “ 8 “ “
3 were 9 “ “

1 was 10 months old.
1 “ 11 “ “
1 “ 12 “ “
2 were from 1 to 2 years old.
8 “ “ 2 “ 5 “ “
8 “ “ 2 “ 5 “ “
3 not given.

There were, therefore, no cases under the age of three months, 23 cases between the ages of three and six months, or nearly one-half of the entire number, 8 from the age of six months to one year, and only 18 between the ages of one year and twelve. These statistics correspond, in the main, with those of Rilliet and Barthez, in whose collection of 25 cases there was no one under the age of four months.

The great liability to intussusception in infancy is due partly to the anatomical character of the intestine in this period of life, and partly, doubtless, to the fact that there are more frequent irregularities in the intestinal movements than in older children. In the infant the walls of the intestines are thin, the mucous and muscular coats and the connective tissue being much less developed than in those that are older; the mesentery and meso-colon have also greater depth as compared with the same in other periods of life, except the meso-colon at the points where it passes over the kidneys, in which places it is very short, or even in some cases nearly absent. Moreover, the space occupied by the large intestine, in which part of the digestive tube intussusception commonly occurs, is much shorter relatively to the length of the intestine than in those that are older. In about thirty measurements, which I have made of the length of the large intestine and the space occupied by it, the latter was found, in the average, about one-third that of the former, which, of course, necessitates doubling of the intestine on itself. These peculiarities of structure in the infant obviously favor the occurrence of intussusception.

SEAT AND PATHOLOGICAL ANATOMY.—While the simple or reducible variety of intussusception is usually multiple, the irreducible form is ordinarily single. Two exceptional cases will be presently related. In one case in our table there was a reducible in addition to the irreducible invagination.

While the simple variety is seated in the small intestine, the seat of the irreducible form is, with occasional exceptions, the colon. The colon constitutes the entire invaginated mass, or else, and more frequently, it forms the exterior, while the incarcerated portion consists wholly or in part of the ileum.

Intussusception in the Small Intestines.

Bouchut says: "M. Rilliet states, in a recent treatise, that in infancy the intestinal invagination is always accomplished at the expense of the large intestine, and that there is never invagination of the small intestine. This is incorrect. I have observed the small intestine invaginated in the adjacent inferior part. Taylor has reported a case of this kind in a child twenty months old, who died after an attack of acute peritonitis. M. Marage has seen another case in a child thirteen months old, who recovered after having voided the invaginated portion furnished with two of those diverticula so frequent in the small intestine of the fœtus."

But from all that appears, the case reported by M. Marage may have been, and probably was, an example of the common form of intussusception, namely, of the ileum into the colon. I am not certain what case observed by Mr. Taylor is alluded to, but if it is No. 18 of our table, as is probable, we see that the invagination was really of the ileum into the colon, although a small portion of the ileum next to the valve had not been inverted, and constituted a little of the exterior of the mass.

Intussusception, irreducible and fatal, may, however, occur in the small intestines in infancy as well as childhood. Probably the displacement is at first of the simple variety, but, continuing and increasing in extent, its return becomes impossible. The positive statement of so great an authority as M. Rilliet, that irreducible intussusception does not occur in the small intestines, justifies the publication of the following cases, which establish the fact that there are instances, though not frequent, in which the disease does have this location.

CASE 1.—Male. This patient's health had been uniformly good, and nothing unusual was observed in his condition till the age of four and a half months, when he became restless as if in almost constant pain, with occasional exacerbations. Castor oil was prescribed, which operated freely, and then the following mixture:—

℞. Magnes. calcinat. ℈j;
Tinct. opii camphorat. ʒij;
Tinct. assafœt. ʒss;
Aq. anisi ℥j. Misce.
Dose, ten to twenty drops, repeated according to the pain.

These remedies failed to give relief, as did also chloroform given in doses of two drops. After two or three days, another set of symptoms arose, those characteristic of pneumonitis, namely, hurried respiration, accelerated pulse, short, suppressed cough, and expiratory moan. He was treated with the oiled-silk jacket, and mild counter-irritation, and took an expectorant mixture containing carbonate of ammonia. In a few days the pulmonary disease was evidently subsiding, but the pain in the abdomen, with occasional exacerbations, continued. His countenance was pallid, and bore an expression of suffering. There was no distension or tenderness of abdomen, and no abdominal tumor. He took little nutriment, and seldom vomited. In the last part of his sickness the dejections were scanty, and the last three days his stools consisted mainly of mucus and a little blood. The pain seemed to be growing less, when he was seized with convulsions, and died the same day, precisely two weeks from the commencement of his sickness.

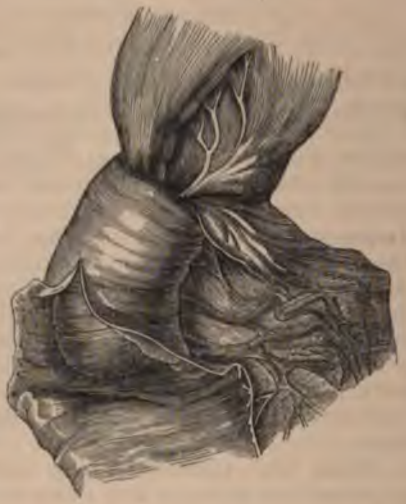
Sectio Cadaver.— Head not examined; body slightly emaciated; mucous membrane of trachea and bronchial tubes vascular; posterior portion of the lower lobe of each lung solid, of a greater specific gravity than water, and allowing only partial inflation; it was in the second stage of pneumonitis. Stomach, duodenum, jejunum, healthy. In the upper part of the ileum was an intussusception two-thirds of an inch long, presenting no trace of inflammation, either within or around it, and its vascularity, when it was examined externally, did not seem notably increased. Above the intussusception the intestine was empty; below it, and chiefly in the small intestine, was a dark-colored substance evidently blood, and giving in a few hours the offensive odor of decaying animal matter. There was a passage through the intussusception, at least two or three lines in diameter, as shown by a probe. The intussusception sustained the weight of sixteen inches of the intestine, and it would apparently have sustained considerably more. The remaining organs were healthy.

CASE II.—F. S., a female infant, four months old, was treated at the New York Infant Asylum in June and July, 1865, for entero-colitis, the usual epidemic of the summer season. The following records show the state of the bowels immediately before her death:—

June 29th. Has five or six stools daily. 30th. Two stools in twenty-four hours. July 1st. Had two stools since the last record; no vomiting. 3d. Four dejections in twenty-four hours. 4th. The diarrhœa continues as before; dejections about four daily. On the 6th of July she died.

Her pulse during the time in which these records were taken generally numbered about 128 per minute. She was much emaciated, and the day before death she frequently struck her head with the hand. The medicines employed were mainly alkalies and astringents.

Sectio Cadaver.—Parietal bones united; serous effusion lying over the convolutions of the brain, under the arachnoid; occipital bone depressed; commencing at a point about two feet below the stomach were four intussusceptions two or three inches from each other. The invaginated masses were from one to one and a half inch in length, and three of them were found to be very vascular in their interior. Above,



between, and immediately below the intussusceptions the intestine was healthy. One of the invaginations was tested by weight, and was found to sustain one and a half foot of intestine, and would have sustained more. Water poured above these intussusceptions escaped through them very slowly; no fibrinous exudation; descending colon vascular and thickened, and solitary glands enlarged.

The irreducible character of the intussusceptions in the above cases was shown by the fact that they sustained weights which doubtless produced greater traction than that exerted by the intestine in its normal action. That the displacement existed prior to the moment of death was shown not only by the symptoms in one case, but by the anatomical changes which had occurred in both. In one the capillaries of the incarcerated mass were ruptured during the last days of life, so as to produce sanguineous stools; while in the other there was intense congestion of the confined membrane, while that adjacent was healthy.

In both cases there was less violence of symptoms, and the disease seemed to come on more gradually than in the first and second cases of our table, in which the portion of intestine which was engaged was the same, but the patients older. In fact, the imprisoned intestine was pervious, so as to allow the passage of food in one case through the entire sickness, and in the other till near the close [illegible] he pos [illegible] inations, the intestines were found empty above the intussusceptions, and water slowly passed through them.

It is my opinion that intussusception of the small intestines in the infant, commencing as the simple form, may become irreducible, and yet remaining pervious continue for weeks without giving rise to those severe symptoms which ordinarily characterize this disease. The following case, which I have not thought best to include in my table, was apparently an example of this:—

CASE.—Male child, died at the age of nineteen months, the last eleven of which he was under observation. The mother states that he had never been well since the age of one month, and that there had been little variation in the symptoms of his disease. During the period in which he was under observation, he was ordinarily fretful, and frequently seemed to be in considerable pain. His stomach through this whole time was so irritable, that he rarely took more than three or four spoonfuls of nutriment without vomiting. There was usually more or less diarrhœa, but no tenderness or distension of abdomen. He became slowly but gradually more emaciated, and finally died in a state of extreme emaciation and exhaustion. He had no convulsions, and was conscious to the last.

Sectio Cadaver.—Brain not examined; lungs healthy, except a circumscribed portion, which was inflamed at the summit of the right lung; liver small and almost destitute of oily matter, as shown by the microscope. In the jejunum, about two feet below the stomach, was an intussusception two inches long, the intestine forming which seemed to have undergone no structural change. Above the intussusception the intestine was of small calibre, and entirely empty and pale; below the intussusception the intestine was somewhat larger than above, but it seemed quite healthy. The invagination was sufficiently pervious to allow water to pass through it, and it readily sustained the weight of two feet of intestine. From eight to ten inches below this intussusception there was another, which was immediately drawn out the moment the intestine was disturbed. The other abdominal viscera were healthy.

There is uncertainty as to the duration of intussusception in the above case. Though the symptoms indicated that it existed a considerable time prior to death, yet there was no strangulation, nor indeed any appreciable anatomical alteration in the coats of the intestine. The fact that the invaginated mass sustained two feet of intestine, and required considerable traction for its reduction, transfers the case from the simple to the irreducible variety.

Intussusception in Large Intestines.

In most cases of irreducible intussusception in infancy and childhood, the ileum is invaginated in the colon, or the first part of the colon is invaginated in the part succeeding it. By referring to the table (Appendix) it will be seen that intussusception not unfrequently begins in the prolapse of the ileum through the ileo-cœcal valve, in the same way that prolapse of the rectum occurs through the sphincter ani. If death take place early, as in Case 6, only a small portion of the ileum may have passed the valve. If the case is protracted, the tenesmus brings down more and more of the ileum, with its accompanying mesentery. The constriction of the valve, which acts as a ligature, soon prevents the further descent of the ileum; and, the tenesmus continuing, the next step in the morbid process is the inversion of the caput coli, which is drawn into the colon by the descending mass, and, unless the case terminate by sloughing or death, the ascending and transverse portions of the colon are successively invaginated. The records show that intussusception occurs as above stated in a large proportion of cases. In one case, No. 18, the intussusception began a few inches above the valve, so that the ileum constituted a small portion of the exterior of the mass. Occasionally the cœcum is the part primarily inverted and invaginated, and, descending along the colon, it draws after it the ileum, which sustains its natural relation to the ileo-cœcal valve. When this occurs the cœcum is found at the lower end of the mass, and two orifices are observed, one leading through the valve, and the other into the appendix vermiformis. In Cases 14, 17, 20, 21, 26, and 37 (Appendix), the intussusception evidently commenced with the caput coli. These two forms of invagination—that in which the ileum, passing through the ileo-cœcal valve, successively inverts and draws after it the caput coli and the divisions of the colon; and that in which the caput coli is primarily invaginated, and descending along the large intestines, inverts the latter, and draws after it the ileum—constitute the vast majority of cases of this disease in infancy and childhood. In Cases 5 to 42, the parts invaginated were the ileum or caput coli, or both, generally with a portion of the colon. In one case, 44, the intussusception was in the transverse colon; in one, 43, in the descending portion; and in one, 45, in the lower portion of the descending colon and in the rectum. Rarely (24, 35, and 37) double invagination occurs. The first invagination becomes arrested in its progress, and by the strong expulsive effort of the patient, descends into the portion of intestine below, forming a mass of great thickness, and necessarily fatal. In exceptional cases there is so little constriction of the invaginated intestine that it remains pervious, though with diminished calibre. In these cases life may be protracted for weeks or even months, the evacuations being sufficient for the wants of the system. Death occurs, finally, in a state of exhaustion. Case 9 was a notable example of this. This child, four months old, lived six weeks after the symptoms of invagination commenced, and seventeen days "with a portion of the bowel protruding from the anus." It was found at the post-mortem examination that part of the ileum had descended through the entire colon, and had remained pervious. Case 37 was another example of the same. It is not known at what time the invagination began in this case, though there were symptoms of it for seven months before death. During the last six weeks of life, the invaginated intestine protruded frequently from the anus, and was replaced by the mother. In this case "the cœcum was inverted, and descended through the colon to the lower portion of the rectum, carrying with it the ileum and the entire colon, except the last ten or twelve inches." In Case 21 the symptoms indicated a continuance of the disease for three, if not eight, months. As the intestine becomes invaginated, its mesentery or meso-colon is also invaginated, and, with rare exceptions, its veins compressed. The pathological state of the incarcerated mass soon becomes that of intense congestion. In infants, usually in a few hours, so great is the distension of the capillaries that they give way, blood escapes into the intestine, and passes from the bowels in scanty motions. On examining the invaginated intestine after death, if gangrene has not occurred, it is found of a uniform intense red color, sometimes resembling to the naked eye a long and firm clot of blood. In those who die early there are no traces of inflammation, but in more protracted cases the attrition between the serous surfaces excites local peritonitis. In none of the fifty-two cases in which post-mortem examinations were made, did the inflammation extend more than a few lines beyond the invagination. Usually the intestine forming the exterior of the invaginated mass is much drawn together or puckered. In the case treated by myself, 36, the entire large intestine which formed the exterior was compressed within a space of six inches or less, since about twelve inches of the ileum doubled on itself, passed through the entire colon so as to protrude from the anus, the only part of the large intestine inverted being the caput coli. In Case 18, six or seven inches of the ileum, which formed a portion of the exterior of the mass, were compressed within the space of one inch.

The abdomen, at first of natural fulness and soft, usually becomes more and more distended till the close of life; but in cases of much vomiting the distension is moderate. This fulness is due to gas and fæcal accumulation above the invagination. The portion of intestine below it is generally empty, unless it contain a little blood, and is sometimes contracted.

There are few morbid changes in intussusception beside those pertaining to the intestine. Sir James Y. Simpson saw Case 51, and remarked, before the medical society at which the specimen was exhibited, that it appeared to him, from the distended state of the cutaneous veins, that the ascending vena cava was compressed by cicatrization at the point where the intestine had sloughed. In Case 40, there was probably compression of the left iliac artery; for two days after the expulsion of the cœcum and a part of the colon which had sloughed, pulsation ceased in the left leg, and all that part below the patella became gangrenous. The patient gradually recovered with the loss of the leg. The only probable explanation of such cases is that the bloodvessels are compressed by the cicatrization and contraction which follow the sloughing of the intestine, such as occurred in Case 48. This child, on the eighth day of his sickness, lost by stool fifteen to eighteen inches of the ileum, after which he rapidly recovered. Twelve weeks later he was seized with typhus fever, which proved fatal in two weeks. The records state, "The traces of the diseased bowels were visible by a considerable puckering and contraction where the slough had taken place and the parts united." This case shows that the supposition that cicatrization in rare instances arrests the circulation and gives rise to gangrene receives confirmation from post-mortem inspection. In Case 40, although the cœcum and a part of the colon contiguous were discharged, the seat of the invagination was probably the descending colon, if not lower still, so as to correspond with the common or perhaps internal iliac artery.

SYMPTOMS.—The symptoms vary according to the age of the patient and the degree of strangulation in the part invaginated. Pain in the abdomen, usually paroxysmal, is among the first, and is one of the most conspicuous symptoms. It is often severe, resembling the pain of hernia, and abating only with the failing strength of the child. After the first few days, if inflammation arises, the pain is continuous, though more severe in paroxysms. At first pressure upon the abdomen is tolerated, but afterwards there is tenderness. This is also due to the inflammation, which occurs in and around the invaginated mass. It is therefore confined to the part of the abdomen which corresponds with the invagination. At this point the abdomen is more full than elsewhere, and not unfrequently the physician can feel the invaginated mass and detect its exact location. Sometimes, at an early period as well as late, cerebral symptoms occur, as in Case 6, which terminated in convulsions on the second day. Convulsions are, however, comparatively rare, and the mind is generally clear till the last moment. In infants the countenance, in the intervals of pain, in the first stages of the complaint, is often placid and not indicative of any serious disease, but in older patients constant and severe local symptoms, referable to the intussusception, commence early. At an advanced period, whatever the age, the countenance becomes anxious and haggard, the eyes hollow or sunken, the body loses its plumpness, and, if the case is protracted, becomes emaciated.

Vomiting is rarely absent; in thirty-nine out of forty-seven cases it is stated to have been present; in seven cases there is no record of this symptom, while it is recorded absent in only one case. This is Case 52, the record of which is very meagre, and death occurred the second day. The vomiting becomes stercoraceous in a few days, and it ordinarily continues with greater or less frequency till the period of collapse. It relieves partially the distension.

The appetite is impaired and often entirely lost. Infants at the breast commonly nurse, however, for several days, probably from thirst rather than hunger.

There is commonly one natural evacuation from the bowels after the intussusception commences, and then obstinate constipation succeeds. This evacuation consists of the excrementitious matter below the invagination. In children under the age of one year, scanty motions of blood mixed with mucus begin to occur in a few hours. In twenty-seven children under this age I find that twenty-four had such evacuations, occurring in most of them several times in the course of the day; in two of the twenty-seven there is no record of this symptom, but in the remaining case it is stated to have been absent. Scanty evacuations of blood unmixed with fæcal matter have been considered pathognomonic of intussusception in the infant, and we see the ground for such belief; but in exceptional instances the invaginated mass is partly pervious, and although the dejections may contain blood they are also excrementitious. In our collection of cases are three examples of this in infants under the age of one year. One has already been referred to. In this case there was the rare anomaly of so large an opening through the ileo-cœcal valve, as to allow not only prolapse and descent of the ileum through the entire colon, so as to protrude six inches from the anus, but also fæcal passages through it daily.

In children above the age of one year, the capillaries of the invaginated intestine are not so frequently ruptured as under this age, and sanguineous evacuations are therefore less common. I have records of nineteen cases between the ages of one year and twelve, in only six of which is it stated that there were bloody motions, and in these the blood was not passed frequently, nor even in some cases daily, as in infants, nor in so pure a state, unless in Cases 9 and 11, the records of which are not explicit on this point. Two of these six patients passed moderate bloody evacuations after protracted periods of constipation, one had fæcal discharges with the blood through the entire sickness, and in one blood was passed at first but finally the stools were entirely excrementitious.

In those above the age of one year, there was for the most part obstinate constipation, no dejections, whether bloody or fæcal, occurring for several days, but there were a few exceptions. In Cases 7, 21, and 37, the bowels were relaxed. The ileum, in these three cases, had descended through the entire colon, or the larger part of the colon, and being pervious, the fæces escaped from the anus without detention in the large intestine, or with detention only in its lower portions, and were therefore liquid.

Tenesmus is another symptom. It is not always present, but in a large proportion of cases, even when the invagination is in the upper part of the large intestine, it is a frequent and distressing symptom. It often does not commence till there is a considerable amount of displacement, and it ceases when the strength is much reduced.

The temperature of the surface is normal in the commencement of intussusception; but finally, as febrile reaction comes on symptomatic of the inflammation, it rises and continues above the healthy standard till the intestine sloughs, or till the stage of collapse occurs which ushers in death. The pulse, especially in the infant, is tranquil at first, but, whatever the age, it soon becomes accelerated from the paroxysms of pain, and subsequently from the inflammation which occurs in the invaginated mass. There is no disturbance of respiration, except that it is somewhat hurried from the fever, and from the pain felt in advanced cases on full inspiration.

It will be seen that the symptoms vary in certain particulars, under the age of one year, from those occurring over that age, but differences in the symptoms depend more on the degree of invagination and constriction, than on the age and exact location of the disease.

Diagnosis.—The diagnosis of intussusception is not, in general, difficult, except at its commencement. When the inversion has reached that degree at which obstruction occurs, the symptoms are, in most cases, such that the disease can be readily diagnosticated. In the cases the records of which I have collected, a correct diagnosis was, with few exceptions, made, and at an early period. In the infant, the disease for which intussusception is most frequently mistaken is dysentery, on account of the tenesmus and the muco-sanguineous stools. In certain of the reported cases this mistake was not rectified until it was ascertained that purgatives produced no fæcal evacuations.

The symptoms which are commonly present, and which indicate the nature of the disease, are obstinate constipation, vomiting, paroxysmal pain referred to the seat of the disease, and tenesmus. In the infant, also, scanty evacuations from the bowels of mucus and blood, or of pure blood, is an important diagnostic sign. It should be borne in mind, however, that in exceptional cases the displaced bowel may remain pervious, and the symptoms which possess so great diagnostic value therefore be absent. There may be no vomiting or tenesmus, and there may even be diarrhœa in place of constipation. As an aid to diagnosis, it should be stated that whatever the age of the child affected with intussusception, clysters are commonly administered with difficulty, and are quickly and forcibly returned, on account of the resistance opposed by the invaginated mass. The seat and even extent of displacement can be ascertained in a large proportion of cases by a digital examination of the abdominal walls. The tumor can be felt hard, elongated, and tender on pressure. If the invagination be in the lower part of the large intestine, it can sometimes be discovered by an examination per rectum.

Duration.—In the following table, the duration of the intussusception in forty-nine cases is given, as nearly as it can be ascertained from the records:—

2 died the 1st day.
6 “ “ 2d “
14 “ “ 3d “
2 “ “ 4th “
5 “ “ 5th “
2 “ “ 6th “
2 “ “ 7th “
1 lived over a week.
1 died the 8th day.
1 “ “ 10th “
1 “ “ 14th “
1 lived nearly a week.
1 “ (Case 9) 6 weeks.
3, time of death not given.
7 recovered.

In the three remaining cases, 4, 21, and 37, the exact duration is not certain; but it was probably far beyond the usual period.

The second of these (21), a girl of six years, having eaten raw carrots, was seized with pain in the abdomen, which lasted eight months, when she died. During the last three months she passed mucus and blood. In this case the cœcum had descended to the anus, drawing with it the ileum, which remained pervious. The symptoms indicated the continuance of the invagination for three months if not eight. In the third case (37), the child complained of pain in the abdomen for many months, and occasionally vomited. During the last six weeks of his life, all the phenomena of invagination were present. The pathological condition of the intestine found after death was essentially the same in both cases.

In West's *Treatise on Diseases of Children* (fifth edition, 1866, page 504), it is stated that death in this complaint always occurs within a week. The above statistics, however, show that there are exceptions to this statement, although a large majority do die within the first seven days. In thirty-three of the cases embraced in my statistics death occurred within the first week, and in no fatal case in which strangulation was complete was life prolonged beyond the eighth day. In these cases of complete strangulation the average duration was 3.7 days, and the largest number of deaths occurred on the third day. Death on the first day is rare, but it occurred in two instances. When so early it is often, if not generally, through convulsions and coma.

Prognosis.—Intussusception is in its nature so grave an accident that the physician called to a case should always expect and predict a fatal result. A favorable issue is only through an unusual combination of circumstances. But, while death is the common result, there are three different modes of termination in which life is preserved. First, the reduction of the incarcerated intestine, with immediate relief. There can be no doubt that it is possible for intussusception, when recent, to be reduced by the unaided action of the bowels, in the same way as the common, simple intussusception in the jejunum and ileum, or as hernia is reduced, through the vermicular action of the intestines. For sometimes, as in Case 6, there previously have been the same symptoms as those which accompanied the fatal attack, and which subsiding, the patient remained for a time in perfect health. This termination is probably rare, if the symptoms are sufficiently marked to necessitate treatment. A considerable number of observations also establish the fact that intussusception may occasionally be cured by early and well-applied treatment. The physician may succeed in reducing the displaced intestine, even if the intussusception is in the upper part of the colon. Relief in these cases, whether by the unaided movements of the intestine or by the physician's art, is obviously immediate.

A second mode of favorable termination is alluded to by certain foreign writers. The intussusception continues for a considerable period with the characteristic symptoms, and then, as Bouchut expresses it, "the vomitings gradually cease, the intestinal hemorrhage disappears, the strength returns, and the health becomes restored without the expulsion of fragments of the intestine." What changes the displaced intestine undergoes in these protracted cases, which gradually recover without sloughing, have not been clearly ascertained, although they have been the subject of conjecture. According to Rilliet, a large proportion of favorable cases terminate in this manner. It does not appear, however, from the statistics which I have collected, that this is a common mode of recovery. The clinical history of intussusception establishes the fact that in a large majority of protracted cases there is either death, or the third mode of favorable termination, namely, by sloughing.

Infants with intussusception other than the simple form, which was described at the beginning of this paper, commonly die. The reason of this is obvious when we consider that, in a few hours after the invagination begins, the imprisoned mass, with now and then an exception, becomes so congested that its capillaries give way, and its reduction is impossible by any appliance of medical art. We cannot reasonably expect recovery except through sloughing and the expulsion of the intestine; and few infants have the requisite strength for so tedious and exhaustive a process. The youngest child that recovered in this way, so far as I can ascertain, was one reported by M. Marage, namely, an infant thirteen months old. With the exception of this case, the youngest was (42) a boy, five years of age. The older the child, the greater, of course, the power of endurance, and the better the prospect of recovery. In our collection are the records of seven cases which resulted favorably by sloughing. These children were of the ages of five, six, six, nine, eleven, twelve, and twelve years. The separation of the invaginated mass occurred in six of these between the sixth and twelfth days, with an average of nine and a half days, the time not being given in one case. If, then, the patient can be carried through the first week without too much exhaustion, we may each day look for the discharge of the slough, the reopening of the bowels, and ultimate recovery.

In those rare cases in which there are daily fæcal dejections, recovery is still improbable. At an early period reduction is no doubt more easy in these cases than when there is strangulation, but from the absence of strangulation the intussusception usually becomes greater, and sloughing is less likely to occur; so that, although the case is more protracted and the symptoms less severe, death is the ordinary result.

MODE OF DEATH.—In a large majority of cases death is through asthenia. There may be convulsive movements, more or less marked, but the prevailing characteristic as death approaches is extreme exhaustion. In exceptional cases the life of the sufferer is cut short by convulsions before the stage of exhaustion is reached, as in Cases 2 and 6.

TREATMENT.—It is unfortunate, in cases of intussusception, that the time in which treatment can be of most service is apt to pass by, before the true condition of the intestine is detected. Invagination being comparatively rare, the patient is generally on the first day treated for colic or dysentery or some other common affection of the bowels; and it is often not till the second day, when the intestine has become incarcerated, that the physician accurately diagnosticates the disease. The purgative medicines usually given in the commencement injure the patient. In fact, both reason and experience teach us the impropriety of such treatment in this complaint. Cathartic remedies act as a *vis à tergo*, and may cause a still further descent of the inverted intestine. Yet such powerful agents of this class as quicksilver have been employed. It was administered in two doses of one ounce each in one of the cases embraced in my statistics, but none of the mineral passed the bowels. At the post-mortem examination a considerable part of it was found in small globules, coated with a black layer consisting of the sulphuret or black oxide of mercury in the intestine above the intussusception. It need not be added that the case was speedily fatal.

The proper treatment of intussusception consists in attempts to reduce the displacement by pressure from below. This pressure may be applied either by liquid injections into the rectum, or, which is far preferable, inflation of the lower intestine by air or gas. If reduction is not effected after sufficient trial, the indication is to sustain the strength of the patient and give palliative remedies in the hope that recovery may take place through the process of sloughing and adhesive inflammation. If we may judge from the remarks of physicians who have reported cases, and by discussions in societies in which specimens have been presented, this mode of treatment is accepted by the profession generally, and the medical journals contain many reports of cases successfully treated in this manner. Inflation as compared with liquid injections produces a more equable and effective distension of the external or incarcerating portion of intestine, and cases of cure by inflation have been reported after injections had failed. Treatment by inflation, which indeed ought to occur to any intelligent physician, appreciating the anatomical condition of the parts, as the correct mode, was prominently brought to the notice of the profession in modern times by Mr. Samuel Mitchell, in a communication to the London *Lancet* for March 17th, 1838.

"I take the liberty," he writes, "of suggesting to the profession, through the medium of your valuable periodical, the trial of inflating the bowels by means of a glyster-pipe attached to a common pair of bellows; it has fallen to my lot to witness several of these most distressing cases in children; the nature of the obstruction was foretold during life, and unfortunately verified by *post-mortem* examination. The last case of the kind which came under my care, about two years since, presented all the usual symptoms: intolerable restlessness, the most obstinate sickness, the singularly distressed state of countenance, and shrunken features. The usual remedies were had recourse to, viz., warm baths, glysters, anodyne frictions over the abdomen, etc., but without avail. As a forlorn hope I made trial of inflation by the above means, with the most happy result. The sickness immediately ceased; the child within an hour passed a natural stool, and in the morning was almost without ailment."

This mode of treatment is termed novel in the *Lancet*, but it is really as old as the time of Hippocrates, who speaks of throwing air into the bowels, by which flatulence is imitated (flatus immitatur). (*Hippocrates' Works*, translated from the Greek by Grimm, 4 bd., page 198.) Haller also recommended the same treatment: "Flatus etiam immissus celerime susceptionem dispellet." (*Physiologia Corporis Humani*, tom. vii. p. 95.) In the *Edinburgh Medical Journal*, October, 1864, Dr. David Greig relates five cases of successful treatment of intussusception by inflation. The first, an infant six months old, previously in good health, suddenly became very fretful, apparently having severe paroxysmal pain in the abdomen. She had vomiting, and finally tenesmus, with bloody evacuations. Warm water enemata could not be administered on account, the writer thinks, of the spasmodic action of the intestines, and an abdominal tumor could be distinctly felt near the umbilicus.

Castor oil and a purgative powder, and enemata of water having been employed in vain, and the case becoming really critical on the second day, inflation was employed. The writer says: "The nozzle of a small pair of bellows was introduced into the anus, and air injected to a considerable extent. Contrary to our expectation, the air passed readily into the bowel, and seemed to give the child great relief. After the injection it lay very quiet, as if asleep, and evidently quite free from pain. In about twenty minutes from the time the air injection was administered a slight rumbling noise was heard in the child's abdomen, followed by a crack so loud and distinct as to alarm the attendants in the room, who thought something had burst in the child's bowels. The child, however, continued as if asleep and free from pain, and in about half an hour a large feculent stool, slightly mixed with blood and mucus, was passed without pain. During the night the child rested pretty well, had no return of vomiting, took the breast as usual, and in two days was quite well."

Another child nine months old, treated by Dr. Greig, presenting nearly the same symptoms and the abdominal tumor, also obtained relief by inflation, after castor oil and enemata had failed to produce any benefit.

An apparatus for the production and injection of carbonic acid gas has been invented by Schultz and Warker, of this city, and is manufactured by them. It consists essentially of two glass chambers, one over the other. In the lower one a bicarbonate is placed, and in the upper an acid in a liquid state. By the gradual admixture of the two, carbonic acid is set free. An elastic tube conveys the gas from the lower chamber. This apparatus has been used by physicians of the city, for the reduction of intussusception and other purposes, and is a useful invention.

The same firm, and several others in this city, prepare for the shops quart bottles of highly charged carbonic-acid water, from which when inverted a powerful current of carbonic acid gas can be obtained. Two or three of these bottles, with a portion of the tube from Davidson's syringe, which can be readily attached to the stem from which the gas escapes, constitute all that is required for an ordinary case.

The following cases, which I treated with Dr. Büchler, of this city, in 1871, show what may be achieved by inflation, and also the unfavorable result which must inevitably occur in certain cases. A German infant, five months old, nursing, began to be fretful, crying often on March 7th, and before night passed a scanty motion of blood. The symptoms continuing, I was asked to examine the infant on the 10th, and learned the following facts: It had vomited daily, had had daily scanty but infrequent stools, consisting chiefly of blood, accompanied at first by tenesmus, but not within the last day; it continued to nurse, but was becoming thinner and weaker, and was evidently in pain. The symptoms indicating the nature of the disease, the abdomen, which was not distended, was examined for the tumor, which was found in the right side in the site of the ascending colon, apparently about one and a half to two inches in length; pulse 124 in sleep; no cough. An ineffectual attempt was made to reduce the intussusception by a very rude and imperfectly constructed apparatus (the bellows), when from the lateness of the hour farther treatment was postponed till early the following morning. 11th. Tumor still detected in the right lumbar region; pulse 120 asleep, 150 awake. By means of Schultz and Warker's apparatus, the intestines were inflated so as to produce very decided prominence of the abdomen, and the abdomen gently kneaded. After some minutes the gas was allowed to escape, when the tumor had disappeared. In a few hours, a natural evacuation occurred from the bowels, and the infant has remained well since.

The second case ended unfavorably, although the symptoms were apparently no more grave than in the case just related, and had continued a shorter time. This infant was also of German parentage. The tumor, firm and elongated, could be distinctly felt in the left lumbar region. In this case the inverted bottles of carbonic-acid water were employed, and when, after considerable delay and kneading of the abdomen, the gas was allowed to escape from the intestine, the tumor had disappeared. A few hours afterwards convulsions occurred ending fatally. At the autopsy the invaginated mass, which was too firmly strangulated to admit of reduction by inflation, was found in the epigastric region, having been carried up from its former position by the inflation of the intestine below. It consisted of the terminal part of the ileum, which had passed through the ileo-cœcal orifice, and become incarcerated in the ascending colon, and, as is not unusual in these cases, the action of the intestines had changed the location of the tumor in the abdomen from the right to the left side.

Whether air or carbonic acid is employed, it is necessary to produce distension of the intestine to its fullest extent below the seat of the complaint, without endangering rupture, and of course the sooner it is used the better the chance of success. In two or three days the inverted intestine has, in a larger proportion of cases, become so firmly incarcerated, and has descended so far, that attempts to replace it are unsuccessful; still, even at a late period, a persevering attempt should be made, if it has not been previously tried.

If, in the failure of inflation to reduce the intussusception, injections of water are employed, the thighs should be elevated above the shoulders in order to obtain the aid of gravitation, but if inflation is unsuccessful, probably the less effectual method of injection will fail also. The employment of quicksilver by the rectum with the thighs elevated has been suggested to me as a *dernier ressort*. This may be a useful suggestion, especially for those cases in which the intussusception occurs in the descending colon.

When the above measures have failed to relieve the patient, it has been proposed to cut down upon and replace the intestine, in the same way as the surgeon treats strangulated hernia, and this operation is said to have been successfully performed in the adult. If the tumor can be readily detected by external examination, if its position be favorable and the patient an adult, the propriety of such an operation might be seriously considered, but I apprehend that there are few surgeons at the present day who would perform or recommend this mode of treatment in the child. The child, and especially the infant, could hardly recover from the shock of so severe an operation, even if it escaped peritoneal inflammation. As an objection to the use of the knife is the important fact, which distinguishes intussusception from hernia, that sloughing, which finally occurs if life is prolonged, is conservative in the former, though fatal in the latter. After failing to return the intestine by the mode described above, active measures should be discontinued, and the treatment should be expectant. Recollecting that death is from asthenia, and that after a certain time, if the strength holds out, adhesive inflammation occurs, and the mass which closes the intestine sloughs and is expelled, we should endeavor to sustain the vital powers by nutriment and stimulants, and relieve the pain by the judicious use of opiates. At this stage of the complaint there is local peritonitis between the coats of the intussusception, and this requires the administration of opium in some form. Sustaining and expectant measures ought to be adopted at an early period. The diet should consist of beef essence or other concentrated nutriment which leaves little residuum.

Vomiting, which is so co [illegible] no treatment. It relieves the distension and prevents fæcal accumulation, which, pressing downwards, increases the extent of the invagination and counteracts the effect of the injections. Convulsions are to be treated by the local measures which are appropriate when they occur under other circumstances. At first no external treatment is required over the seat of the invagination, but, when the abdomen becomes tender and painful from the local peritonitis, poultices are of service.

SECTION IV.

DISEASES OF CIRCULATORY SYSTEM.

CHAPTER I.

CYANOSIS.

CERTAIN of the diseases which pertain to the circulatory system have been treated of in other parts of this book (umbilical hemorrhage, gastro-intestinal hemorrhage, etc.). It remains to consider that general condition of the blood which is desiginated morbus cæruleus or cyanosis.

In 1863, I read before the New York Academy of Medicine a statistical paper on cyanosis, which was published in the Transactions of that Society. This paper contains an analysis of 191 cases, collated from the various European and American medical journals, and to these cases I am indebted for most of the following facts pertaining to this disease.

The term cyanosis or blue disease is differently employed by writers. Some apply it to cases of transient lividity occurring in the course of acute diseases, as well as to those cases which depend on permanent structural changes, or on malformations. I apply this term, as do most pathologists, only to the latter cases.

Some are inclined to discard the consideration of cyanosis as a disease, regarding it rather as a symptom. Their view is, in my opinion, correct in reference to the cyanotic state, which occurs in certain acute diseases, but not in reference to cyanosis, as I have defined the term and employ it. The propriety of considering cyanosis a disease is more apparent if we are not misled by the term which designates it. Lividity is not its most important or its essential characteristic. It is simply a sign, although conspicuous, and, indeed, the only one by which the disease can be readily recognized. Cyanosis is, in reality, a blood disease, its pathological state consisting in a deficient oxygenation of this fluid, or in an excess in it of carbonic acid, and probably of carbonaceous products.

It should be placed in the same category with leucocythemia and melanæmia.

Statistics show that cyanosis is, with very few exceptions, due to malformation in the circulatory system, and at the centre of circulation, namely, in the heart and in the large vessels which arise from this organ. In the exceptional cases, the cause of the cyanosis is located in the lungs, and is in all or nearly all instances either extensive emphysema in both lungs, firm and thick fibrinous exudation over both lungs, compressing them by its contraction and causing perhaps carnification in parts of them, or the cause is compression of the lungs from caries of the vertebræ, and consequent depression of the ribs. These causes pertain to youth and manhood, rather than to infancy and childhood. On account of this fact and the rarity of such cases they need not be considered in this connection.

Literature of Cyanosis.

The ancient physicians, so far as can be ascertained from their writings still extant, were ignorant of cyanosis; whether they overlooked it, or whether those early ages were exempt from it, and the malformation on which it depends is peculiar to a posterity physically degenerate. The blue disease described by Hippocrates (*De Morbis*, lib. ii. Sec. v. page 485, Ed. de Foë's, 1621) was probably some acute febrile affection. Galen, whose voluminous writings, with an excellent index, are still extant, and whose comprehensive mind embraced the whole range of medical science of the second century, makes no mention of it, so far as I can find. In the middle ages, as appears from a remark of Boerhaave (*Diseases of the Humors*, Acad. Lect. § 732), the common people believed the cyanotic to be the victims of evil spirits; and it is probable that physicians, during this long period of superstition and intellectual lethargy, embraced the popular belief.

On the revival of learning, pathological anatomy began to be more thoroughly and intelligently studied; but it is evident that before the great discovery of Harvey, in the 17th century, it was impossible to refer cyanosis to its true cause. In the latter part of the century so auspiciously opened by Harvey's genius, malformations of the heart were observed and described by some pathologists on the continent, in cases in which cyanosis must have been present; but it is uncertain, from the brief records which they have left, whether any of them understood the dependence of this disease on the abnormal state of the heart. Boerhaave, in the beginning of the 18th century, attributes "a livid or black color diffused throughout the whole skin," evidently referring to cyanosis, to "1, a relaxation of the vessels, while the *vis a tergo* remains the same, or, 2, to a too sudden increased pressure behind, without a relaxation of the vessels." Vieussens, who was a contemporary of Boerhaave, and was more thorough in the examination of morbid as well as healthy structures, narrated the history of a cyanotic patient, with a description of the malformation, but the one who first gave particular attention to the blue disease was Morgagni. This Paduan professor, far excelling his predecessors in thoroughness of observation and accuracy of deduction, published a theory in explanation of the disease which now, after the lapse of more than a century, has many adherents. In the same century with Morgagni, the 18th, but subsequently to his time, Drs. Pulteney, Wm. Hunter, Baillie, Wilson, and Abernethy in Great Britain, and Jurine and Sandifort on the continent, may be mentioned among those who contributed to a knowledge of cyanosis by the publication of cases, with a description of the malformations. Yet, when the present century commenced, no monograph or dissertation had appeared on this disease; and, notwithstanding the publication of cases from time to time, the profession generally were almost totally unacquainted with its nature. No better idea can be given of the prevailing ignorance in reference to cyanosis at this period than by quoting from a case, narrated by Ribes in 1814. (*Bull de la Fac. de Méd.*, Paris, 1815.) The patient had some time previously received an injury of the finger. "Many physicians of Amsterdam," says he, "were at different times consulted on the subject of this affection, no one of whom understood its true cause, its essential character. One considered it as partaking of the nature of epilepsy, and caused by the irritation in the nervous system which the wound in the finger had produced. Others attributed it to the presence of intestinal worms. Some physicians pronounced it an injury of the liver or spleen. Many held it to be a scorbutic affection. One only believed it to be the result of an unknown organic disease."

Since the commencement of the present century the blue disease has received a large share of attention. According to *Forbes's Medical Biography*, the first dissertation on this subject appeared in 1805, from the pen of Seiler, and from this time till 1832 no fewer than twenty-eight dissertations or monographs were published, either on cyanosis, or on malformations, which produce it or at least relate to it. In the list of writers are some of the most eminent names in the profession, as Louis and Bouillaud. The number who have written on this subject since 1832 probably exceeds the number of previous writers. Of those who have contributed most to our knowledge of the disease may be mentioned Farre, Chevers, and Peacock in Great Britain, Gintrac on the continent, and Moreton Stillé in this country. Farre, Chevers, and Peacock wrote on malformations of the heart, alluding incidentally to cyanosis, but their writings contain valuable matter for statistics bearing on the latter subject. Farre's book was published in 1814, and is out of print; Chevers published his papers in the *London Med. Gazette*, commencing in the year 1845, and running through several successive volumes. Peacock's Treatise was published in 1858. It contains several original cases, previously narrated by him to the London Pathological Society. The paper by Moreton Stillé, which has attracted much attention, especially in Europe, was his Inaugural Thesis, and was published in the *Amer. Journ. of Med. Sci.*, in 1844. This paper relates entirely, in the words of the author, to "the laws of the causation of cyanosis." The only really complete statistical paper on the blue disease is that by M. Gintrac, published in 1824, in Paris, and embracing all the cases, which had been accurately reported up to that time, namely, fifty-three. He, indeed, exhausted the subject for the period in which he wrote, and were it not for the accumulation of material since, little could be added to his essay.

Two theories in explanation of the occurrence of cyanosis have divided the profession; the one attributing it to obstruction at the centre of circulation, and consequent venous congestion: the other, to admixture of venous and arterial blood through openings in the septa of the heart, or through the ductus arteriosus. The former of these theories originated with Morgagni more than one hundred years ago, and is essentially the same as that advocated by Stillé. Stillé errs in placing Morgagni among the advocates of the other system. The second theory, or that which attributes cyanosis to admixture of venous and arterial blood, is said by Dr. Peacock to have originated with Hunter, but its ablest supporter was Gintrac. Of late there are some pathologists who do not believe that either theory is sufficient to explain the cause of cyanosis, but that the true explanation lies somewhere between the two. Among the most conspicuous of these is Prof. Walshe of London. These theories will be considered in the proper places.

SEX.—Writers on cyanosis state that there is a preponderance of males to females affected with it. Aberle of Vienna says that two-thirds were males in an aggregate of 180 cases which he collated. In Gintrac's cases, 28 were males and 16 females; in Stillé's, 41 were males and 31 females. The sex is recorded in 134 of the cases collected by me, of which 78 were males, 56 females; and if those cases are excluded in which cyanosis was due to obstruction at the mouth of the pulmonary artery, the number of the two sexes is the same. In the five years commencing with 1858, according to the mortuary returns, 207 died in this city from cyanosis, of which number 117 were males, 90 females. In England, for two years, 418 males died of cyanosis, and 273 females. Although statistics of different cities and countries agree in the fact of an excess of males over females, there does not appear to be that great preponderance of males, which the earlier writers on this disease believed to exist.

CAUSES OF THE MALFORMATIONS.—Mothers sometimes attribute the malformations, and probably correctly, to strong mental impressions felt during utero-gestation. The mother of a patient treated by Dr. Peacock stated that, "two months before her confinement, she was frightened by seeing a child killed, and never recovered from the shock she sustained." (*Malf. of Heart*, p. 37.) In another case "the mother was much out of health, and stated that, when pregnant with the child, she was greatly alarmed by seeing a man who was dying of asthma." (Op. cit., page 57.) In another instance the mother was frightened at the fifth month of pregnancy (page 41); and in still another case, recorded by Dr. Peacock, the mother, four or five months before her confinement, "was greatly alarmed by her husband, who was insane, standing over her for two hours with a loaded pistol." (Page 43.)

Occasionally the malformation appears to be due to some vice or taint in the system of one or both parents. In a case quoted in the *Gazette Médicale* for December 28th, 1850, from another continental journal, it is stated that "the mother, who had formerly suffered from rickets, gave birth to five children, all of whom died immediately or shortly after birth with symptoms of cyanosis. The father died at the age of thirty-six of phthisis." Dr. Peacock relates a case in which the father was livid, and had the "pigeon-breast" common in the cyanotic. In the history of a patient, which was communicated by Cooper to Farre (Case 166), it is related that "vices of conformation of the heart appeared to have been inherent in the family. Of 12 infants only 4 survived, and more presented signs of heart-disease." Dr. Buchanan relates the history of a child which was the second that had suffered and died in the same family in the same way (Case 40). A patient treated by Mr. Leonard was the sixth child of the family, who had died at about the some age, with symptoms of cyanosis. Such instances are, however, exceptional. Ordinarily, the cyanotic have not only healthy parents but healthy brothers and sisters.

A patient whose history is given by Dr. William Hunter was born at the eighth month, but in nearly all other cases the full period of uterine existence was reached.

The opinion was expressed by Gintrac that the number affected with cyanosis, to the entire population, varies in different countries. It is probable that the occurrence of the blue disease is not greatly, if at all, influenced by the nationality, but it is certainly dependent to a considerable extent on the condition of society. It is less frequent in a community in comfortable circumstances, and engaged in wholesome and quiet occupations. Pure air and outdoor exercise, plain, nutritious diet, freedom from cares and anxieties, in fine, causes which promote the physical well-being, diminish the liability to an ill-formed and cyanotic offspring. And, conversely, impure air, improper and insufficient diet, grief, etc., increase the percentage of cyanotic cases. Hence, it is a rare disease in the rural districts, and comparatively frequent in the cities, especially in a large city like New York, which contains a numerous indigent and careworn population, living from year to year in the midst of agencies which operate stealthily but certainly to enervate the system and undermine the health.

These remarks are abundantly substantiated by statistics. In New York City for the six years ending with 1860, there was one death from cyanosis to 436 deaths from all causes; and in Brooklyn the proportion estimated for two years was about the same. On the other hand, in the State of Kentucky, which contains few large cities, and in the death reports of which cyanosis is included in the general term malformation, there was, during a period of five years, one death from malformation to 2469 from all causes. In the State of South Carolina, for three years, there was one death from cyanosis to 5018 from all causes. In the State of Massachusetts, for two years, there was one death from cyanosis to 1136 from all causes, and two-thirds of the cyanotic cases occurred in the counties of Sulfolk, Essex, and Worcester, which contain large cities. In London there was one death from cyanosis to 755 from all causes during a period of three years. On the other hand, in England, including the city of London, there was, for the ten years ending with 1857, one death from cyanosis to 1589 from all causes; and in the rural districts of Monmouth and Wales there was only one death from cyanosis to 5578 deaths from all causes during a period of two years.

TIME OF COMMENCEMENT.—It is an interesting and somewhat remarkable fact that cyanosis, though dependent on a malformation, does not always commence at birth, or, at least, that it does not exist in degree sufficient to produce the cyanotic hue till some time has elapsed after birth. In 138 of the cases of cyanosis which I have collected, the time at which lividity was first observed is stated as follows: In 97 it was within the first week, and generally within a few hours of birth. In the remaining 41 cases it commenced as follows:—

In 3 at 2 weeks.
" 1 " 3 "
" 2 " 1 month.
" 7 from 1 to 2 months.
" 5 " 2 " 6 "
" 5 " 6 " 12 "
" 3 " 1 year to 2 years.

In 6 from 2 years to 5 years.
" 1 " 5 " " 10 "
" 6 " 10 " " 20 "
" 1 " 20 " " 40 "
" 1 over 40 years.
—
41

In these 41 cases, in which blueness did not occur till after the age of one week, if the patient were less than two years old when it commenced, there was frequently no obvious exciting cause, but above this age, with three exceptions, such a cause is known to have been present. It is interesting to observe how trivial the exciting cause frequently is, and equally interesting to note how long patients have enjoyed good health, not having the least lividity, although the anatomical vice, to which the final development of cyanosis was due, had existed from birth.

Dr. Theophilus Thompson relates, in the *Medico-Chir. Trans.*, vol. xxv., the history of a lady, thirty-eight years old, who was well till an attack of Asiatic cholera, after which her health was permanently impaired. Two years before her death she passed through a course of fever, and from this time was cyanotic. In the *Philadelphia Med. Examiner*, June, 1850, Dr. Waters relates a case, in which cyanosis began at the age of six years in an attack of measles. In a case published by Mr. Napper, in the *London Medical Gazette*, 1841, the child fell at the age of six months, and from this time had cyanosis. A female, whose history is given by Prof. Tommasini, of Bologna, and quoted by Bouillaud, became cyanotic at the age of twenty-five in consequence of difficult parturition. In the London *Lancet*, 1842, Mr. Stedman relates a case, in which cyanosis began at the age of ten weeks in an attack of convulsions. In the *American Journal of Med. Sciences*, 1847, Dr. John P. Harrison published the history of a baker, twenty years old, in whom cyanosis began five years previously after great effort in carrying wood. Louis and Bouillaud quote from M. Caillot the case of a child, who became cyanotic at the age of two months in an attack of hooping-cough. Louis also narrates a case in which hooping-cough had the same effect at the age of twelve years. Ribes treated a child in whom the blue disease began at the age of three years from a severe contusion of the fingers. In a case related by Marx it commenced at the age of ten months from a blow on the back, inflicted by the mother. In the *Medical Times and Gazette* for 1855 Mr. Speer gives the history of a female, who at the age of thirteen years was put in a place requiring considerable exertion, and from this time was cyanotic. A patient, whose case is narrated by Cherrier, fell into a deep ditch in the winter season, and immediately after had a low fever, from which the blue disease commenced. In a case published by Tacconus the exciting cause was believed to be fright, in consequence of a fall from a great height, and in another, related by Bouillaud, it was a blow received on the epigastrium after the patient had passed the age of fifty years. Similar cases are related by Mayo and Peacock.

It will be seen that the exciting cause of cyanosis is usually such as produces a profound impression on the system, and affects the action of the heart. Precisely in what way it operates to develop the disease has not been satisfactorily explained. Mr. Mayo conjectures, that in the case related by him there was previously some compensation which ceased, or became inadequate in consequence of some change produced in the economy. Although cyanosis may not appear for months or even years, there is rarely improvement when it is once established. Appearances of amendment are deceptive. The disease when not stationary is progressive, and this explains the fact, that few survive the middle period of life.

SYMPTOMS.—The symptoms of cyanosis vary in intensity in different patients, and in the same patient at different times, being milder if he is quiet and the mind calm, more severe if active, or if the mind is agitated. In mild cases, in a state of rest, they nearly or quite disappear, so that a stranger would not suspect that there was any serious ailment. They are aggravated by any cause which accelerates the action of the heart. In some, cyanosis is increased by the most trivial disturbing influences, among which may be mentioned nursing, dentition, crying, coughing, and slight emotions of joy, sorrow, or anger. In more than one case it has been perceptibly increased by the stimulus of digestion, the color being deeper after a full meal than before.

The cyanotic hue varies in different individuals from duskiness to a deep purple, almost black color. It is usually most marked in the visage, especially the palpebræ, cheeks, nose, and lips, in the ears, fingers, and toes, and upon the mucous surfaces. It is sometimes, without any assignable cause, confined to a portion of the body. In a case related by Mr. Steel in the *London Lancet*, 1838, the upper part of the body was livid and œdematous, and the lower part pallid and shrunken, and yet the malformation of the heart was that commonly present in cyanosis. In the *London Medical Times*, March 8th, 1845, copied from the *Gazette Médicale*, is the history of a child, six years old, in whom the color was deeper on the right than left side. There had been, however, hemiplegia of this side in infancy, but this had entirely passed off. On the other hand, in a case of rare malformation communicated by Cooper to Farre, in which the upper part of the system was supplied chiefly by arterial and the lower by venous blood, the discoloration was general. In rare instances livid maculæ have been observed like those of purpura.

Those affected with cyanosis have generally at birth been well formed and of the usual size, and in most cases, for a considerable period after birth, the appetite is good, bowels regular, and the system well nourished. But when cyanosis becomes so severe, as it does sooner or later, that its symptoms are rarely absent, digestion is imperfectly performed, and the body becomes either emaciated or stunted and puny. It may be stated, as a rule, that nutrition is in inverse proportion to the gravity of cyanosis. In thirty-three out of forty-one cases, in which the condition of the system, as regards nutrition, was recorded either a short time previously to death or at the autopsy, the body was either considerably emaciated or else diminutive, and those who were well-nourished were usually such as had died early, or of some intercurrent disease.

In this connection may be me[illegible] [illegible] rmalities which have been observed in the [illegible] laterally with a projec[illegible] generally describ[illegible] times the most prominent part is directly over the heart, and in one or two cases the sternum was observed to be deflected towards the left. In the majority of the records, however, no mention is made of the external appearance of the chest.

The other abnormal development is more remarkable, and has not been satisfactorily explained. In twenty-eight cases it is stated that the tips of the fingers or toes, or both, were bulbous. This hypertrophy, if slight, is likely to be overlooked, and that it was observed and recorded in so many cases renders it probable that it was present in a much larger number. In one case the anatomical character of this enlargement was examined, and was found to consist chiefly of hypertrophied connective tissue. The nails are often incurvated over the deformity. At a meeting of the Lond. Path. Soc. in 1859, Mr. Ogle narrated the history of a laborer, fifty years old, who had swelling, numbness, and lividity of the left arm, from pressure of an aneurism, and the fingers on this side were clubbed as in cyanosis. A patient whose history is related in the *Glasgow Medical Journal*, and who was believed to be cyanotic in consequence of a highly emphysematous state of the lungs, had a similar development of the tips of both fingers and toes. Why this bulbous growth should occur in consequence of the circulation of carbonaceous and non-oxygenated blood must at present remain a mystery.

An interesting feature in cyanosis is the low grade of animal heat. The temperature of the body is in all cases below that of health. This is especially noticeable in the extremities. There has not been a sufficient number of accurate thermometric observations to determine whether the internal heat is usually reduced. The following only have been recorded: Mr. Fletcher relates the history of a young man in the *Medico-Chir. Trans.*, vol. xxv., in whom the thermometer placed in the mouth did not stand above 80° Fahrenheit. Hodgson reports the case of a man, twenty-five years old, in whom the thermometer placed on the tongue rose to 100°, while in his own case it was two or three degrees below that term. In an experiment, recorded by Nasse, the instrument placed in the mouth fell little if at all below the healthy standard; applied to external parts, it stood at about 21° Reaumer.

The lack of heat is the source of great discomfort to a cyanotic patient. In mild weather he requires a fire to keep him warm, or an amount of clothing which to others would be intolerable, and in cold weather slight exposure strikes him with a chill. Nor can he increase his heat by active exercise, since his infirmity disqualifies him for this.

Although the temperature of the surface is so low, the occurrence of perspiration, sometimes profuse, is mentioned in several of the records.

In severe cases of cyanosis the generative system is imperfectly developed. In the female, menstruation is scanty or delayed, and in the male the signs of puberty are feebly manifest. If the disease is so mild that the symptoms are absent when the patient is in a state of repose, these organs attain nearly or quite their normal development. The catamenia have appeared as early as the age of sixteen years; and a cyanotic patient treated by Cherrier had two children, but they both died of scrofulous affections.

The action of the heart is necessarily much affected. In mild forms of the disease, if the patient is quiet, this organ may beat with considerable slowness and regularity, but in all cases exercise or excitement, which in a state of health would scarcely have any appreciable effect on the pulse, embarrasses its movements, and produces palpitation. In severe cases palpitation is rarely absent, and the pulse is frequent, feeble, and often intermittent. In a large proportion of patients bruits are produced by the irregular circulation through the heart.

The respiration corresponds with the action of the heart. It is accelerated in proportion to the frequency of the pulse. The suffering in this disease is largely due to paroxysms of palpitation and dyspnœa. These occur sometimes without any apparent exciting cause, and when the patient is quiet, but they are commonly induced by those causes which we have already mentioned as aggravating the symptoms of cyanosis. They come on suddenly, and are attended by increase of lividity, distension of the jugulars, and sometimes of the cutaneous veins, and by a sensation of present suffocation. They last only a few minutes, and are succeeded by great depression of the vital powers. In infants, on account of greater nervous irritability, and feeble power of endurance, these paroxysms generally end in convulsions, which occasionally are fatal. A cough is sometimes present, but it is usually slight.

Pain is not a common symptom. Some of the patients complained occasionally of headache, with or v
occasionally also of pain in the chest, but i
extent or whether these symptoms were d

disease. The secretions do not appear to be affected, so far as has been ascertained. The same may be said of the intellectual and moral faculties. In a case related by Dr. Chevers, the child was even said to be precocious. (*Lond. Med. Gaz.*, vol. xxxviii.) The mind is capable of steady application and acquisition, as in health, provided that the emotions are not unduly excited.

Those who are affected with cyanosis are liable to various forms of hemorrhage, but this liability, if we may judge from recorded cases, is greater in youth and adult life than in infancy. In two cases blood was vomited, in one passed by stool, in one it escaped from the gums, in two from the mouth, in eight from the nostrils, and in sixteen it was expectorated. Pulmonary phthisis was, however, usually present in these last cases. In the *Western Journal of Medicine* for 1829, an interesting case is related by Dr. Wm. M. Voris of a girl, nine years old, in whom hemorrhage occurred under the scalp, producing great tumefaction, and nearly closing the eyelids. An incision was made, from which a pint and a half of dark blood escaped, and it was estimated that more than half a gallon was lost during the ensuing two weeks, at the expiration of which time the incision closed. The patient recovered from the hemorrhage but not from the cyanosis.

Towards the close of life there is occasionally more or less anasarca, especially around the ankles, sometimes in the eyelids and face, and rarely to a certain extent over the whole body. In certain patients it coexists with effusion in the serous cavities.

It is evident that one who is affected with the severer form of cyanosis is disqualified for the duties of active life. The sports of childhood and the useful labors of mature years require an exertion for which he is physically unfit. He has not the ability even to engage in animated conversation, for he is overcome by emotions, whether of joy or sorrow. He lives almost an idle spectator of the world around him, prevented by his infirmity from engaging in its pursuits.

Intercurrent diseases, especially those of childhood, are badly tolerated; but hooping-cough is the one which these patients are especially ill-fitted to endure. Still, they sometimes pass safely, not only through hooping-cough, but through some of the most dangerous febrile diseases. It is a question of interest, but about which little is known with certainty, whether these intercurrent affections are influenced by the cyanotic or venous condition of the blood. The symptoms of these affections are no doubt more alarming, mainly on account of the embarrassed action of the heart, and not on account of the state of the blood; still it is reasonable to suppose that malignant and asthenic diseases are rendered worse by the lack of oxygen, and excess of carbonic acid in the circulating fluid.

Probably cyanosis does not furnish immunity from any other disease, although this statement has been made by a high authority. Rokitansky says: "*All forms of cyanosis, or rather all the diseases of the heart, great vessels, and lungs adapted to produce cyanosis, in a greater or less degree, cannot coexist with tuberculosis. Cyanosis affords a complete protection against it, and in this circumstance may be found an explanation of the immunity from tuberculosis which many conditions of the system, apparently very different in their character, afford.*" (*Handb. der Pathol. Anat.*, II. Bd.) This opinion of the distinguished pathologist, notwithstanding his ample opportunities for observation and known accuracy as an observer, is not substantiated by statistics. So far from its being true, the low degree of vitality in cyanosis appears to favor tubercular deposition. I have records of twenty-six cases of cyanosis in which tuberculosis was also present, in several of which the lungs contained cavities. This is about thirteen per cent. of the whole number in my collection—a large proportion, since so many die in early infancy, at which period the tubercular disease is not apt to occur. Cyanosis appears, also, to favor the development of cerebral diseases, especially congestion and coma, as will be seen presently.

PROGNOSIS.—This is unfavorable. Most cyanotic individuals die young. The age which they attain has been made the subject of statistical inquiry by Aberle. He states that in an aggregate of 159 cases, 57, or 35 per cent., died before the end of the first year; 108, or more than two-thirds, died before the age of eleven years; 30 between the ages of 11 and 25 years; and of the remaining 21, five only lived more than 45 years.

The age at which death occurred is given in 186 of the cases collected by myself, as follows:—

In 17 under the age of 1 week.
" 10 from 1 week to 1 month.
" 12 " 1 month to 3 months.
" 11 " 3 months to 6 months.
" 17 " 6 " to 12 "
" 12 " 1 year to 2 years.
" 21 " 2 years to 5 "

In 21 from 5 years to 10 years.
" 41 " 10 " " 20 "
" 20 " 20 " " 40 "
" 4 over 40 "
—
186

Sixty-seven, then or more than one-th [illegible] before the close of the first year; 121, or more than three-fifths, before the age of ten years; only 24 survived the age of twenty years, and four the age of forty years. Of course, the duration of life depends on the nature and extent of the malformations. Some of these are such as render a speedy death inevitable.

MODE OF DEATH.—The mode of death is recorded in ninety-five cases, as follows:—

19 died in a paroxysm of dyspnœa.
10 " suddenly (the exact manner not stated).
14 " in convulsions (infants).
2 " of apoplexy.
7 " from hemorrhage.
6 " of phthisis (though, as we have seen, twenty others had this disease).
2 " of exhaustion, without hemorrhage.
10 " of coma.
2 " of abscesses in the brain.
1 " of each of the following diseases: cerebral irritation, congestion of brain, effusion in the cranial cavity, acute hydrocephalus, paralysis from acute softening of the brain, dysentery, inflammation of heart, syncope, mucus in the air-passages, thoracic inflammation, choleraic diarrhœa, pneumonitis, bronchitis, scarlet fever, croup. One died in trying to walk, one after a spasmodic cough in pertussis, one after a long agony, one after an agony of ten or eleven hours; one is recorded to have died gradually, and three quietly.

The ten who are stated to have died suddenly, probably died in paroxysms of palpitation and dyspnœa, which, we have seen, are easily excited, and of common occurrence in cyanosis. If so, this was the mode of death in 29 cases. Infants, with few exceptions, so far as appears from the records, died in convulsions. Nineteen died of cerebral affections, exclusive of convulsions, and in thirteen of these the cause of death was congestion, apoplexy, or coma. The hemorrhage of which seven died was probably, in most instances, dependent on phthisis, and six are said to have died directly of phthisis. We may, then, regard paroxysms of palpitation and dyspnœa, convulsions, congestive affections of the brain, and phthisis, as common modes or causes of death in cyanosis.

The malformations of the heart and great vessels which give rise to cyanosis are quite numerous. The following table exhibits their character and relative frequency:—

	CASES.
1. Pulmonary artery absent, rudimentary, impervious, or partially obstructed	97
2. Right auriculo-ventricular orifice impervious or contracted	5
3. Orifice of the pulmonary artery, and the right auriculo-ventricular aperture, impervious or contracted	6
4. Right ventricle divided into two cavities by a supernumerary septum	11
5. One auricle and one ventricle	12
6. Two auricles and one ventricle	4
7. A single auriculo-ventricular opening: inter-auricular and inter-ventricular septa incomplete	1
8. Mitral orifice closed or contracted	3
9. Aorta absent, rudimentary, impervious, or partially obstructed	3
10. Aortic and the left auriculo-ventricular orifices impervious or contracted	1
11. Aorta and pulmonary artery transposed	14
12. The cavæ entering the left auricle	1
13. Pulmonary veins opening into the right auricle or into the cavæ or azygos veins	2
14. Aorta impervious or contracted above its point of union with the ductus arteriosus; pulmonary artery wholly or in part supplying blood to the descending aorta through the ductus arteriosus	2
Total	164

From the above table it appears that in more than one-half of the cases of cyanosis, the congenital vice which gives rise to it is located in the pulmonary artery. It is located also, in general, in that part of the artery which is nearest the heart. Its character is different in different cases. Sometimes there is an arrested development of this vessel, and in its place we find simply a ligamentous cord extending from the heart as far as the ductus arteriosus, while beyond this point the artery and its branches are pervious; rarely the entire artery is ligamentous and, of course, impervious; in other cases this vessel is open through its whole extent, but the part nearest the heart is so small as to be properly considered rudimentary; in others still there is adhesion of the valves to each other as the chief congenital defect, and, finally, in rare instances the obstruction in the pulmonary artery is due to an adventitious membrane, which stretches across the vessel like a diaphragm. These last malformations, namely, adhesion of the valves and the formation of an adventitious membrane, are, doubtless, due to inflammation occurring in the artery before birth, and some attribute the arrested development and ligamentous state of the vessel to the same cause.

In most cases of cyanosis due t
there is deficiency in the inter-auri
This deficiency obviously result
are formed in the heart, af

the blood, being prevented by the vicious formation from flowing in its proper channel, necessarily passes to the opposite side of the heart. More or less blood being forced from one auricle or one ventricle to the opposite cavity, it is evident that a permanent aperture must result in the septum. The aperture in the septum ventriculorum is ordinarily at its base; in the septum auriculorum, it corresponds with the foramen ovale.

In most of the obstructive malformations one and rarely two abnormal cardiac murmurs have been observed. The single murmur accompanies the ventricular contraction. As it has been observed in cases of complete as well as incomplete obstruction, it seems to be due mainly to the flow of blood through the apertures in the septa.

MODES OF COMPENSATION.—In most cases of cyanosis, the congenital defect is partially obviated by modes of compensation. In the most frequent malformation, that in which there is obstruction in the pulmonary artery, and a considerable part if not all the blood flows directly from the right to the left side of the heart, the ductus arteriosus not only remains open, but is greatly enlarged, through which a current of blood enters the pulmonary artery from the aorta, and passing to the lungs is oxygenated. The bronchial arteries have also been found greatly enlarged, and it is believed that though they are the nutrient arteries of the lungs, the blood which they convey to these organs is decarbonized in its circuit through them. In a case published by Mr. Le Gros Clark, in the *Medico-Chir. Trans.*, vol. xxx., the bronchial arteries were not only enlarged, but a "branch from the internal mammary artery, which accompanied the phrenic nerve, was nearly equal in size to the parent trunk, and expended itself principally in the adjacent adherent lung." Branches of the intercostal arteries have also been found enlarged, and entering the lungs, or connecting with vessels which entered the lungs. By such modes of compensation cyanosis is rendered milder, and life is prolonged. To these we must attribute the fact that some have very considerable malformation, and yet do not become cyanotic.

MORBID ANATOMY.—This, as regards the circulatory system, has been sufficiently dwelt upon. No chemical analysis, so far as I am aware, has yet been made of cyanotic blood. We know that it is dark, its coagulability feeble, that it contains an excess of carbonic acid, and is deficient in oxygen. From the nature of cyanosis, it would be inferred that in many cases there is a degree of passive congestion in the cavities of the heart, and consequently in the capillaries of the systemic system, giving rise to more or less serous effusion. Statistics show that this is so. The quantity of pericardial fluid is in some patients increased. I have records relating to this fluid in fifty-one cases. Usually it was pure serum. In seventeen the quantity was half an ounce or less, if we include in the number those in which the amount is expressed in such terms as "due quantity," "unusual amount," and "small amount." In twenty-four cases the serum exceeded half an ounce; usually estimated at from one to six ounces, but in two it exceeded the latter quantity. In one of the twenty-four the serum was sanguinolent. In two cases the records state that there was a small quantity of blood in the pericardium, and in the remaining patient the two pericardial surfaces were agglutinated by inflammation.

In some of the autopies serous effusion was found in the pleural cavities, usually in connection with pericardial effusion, and in at least one instance the serum was tinged with blood. Old adhesions between the costal and pulmonary pleura were observed in a few instances. The condition of the lungs was recorded with more or less minuteness in one hundred and ten cases. Mention has already been made of the large number affected with tubercular disease, which was either confined to the lungs, or was chiefly exhibited in these organs. In thirty-five patients the records state that the lungs were of small size, either by compression, or sometimes, apparently, by the continuance of the fœtal state over a greater or less portion of the organ. The compression was produced either by the distended pericardium or by effusion in the pleural cavities. In thirty-five cases the lungs presented a dark color. This hue in some specimens accompanied the unexpanded or fœtal state of the organ, but in others there was the normal inflation, and the dark color was due to engorgement or congestion. In other cases the lungs are stated to have been natural, except the color. In nine there was emphysema in a part of the lungs, in two pneumonitis; in two the color was pale, in one a bright crimson; in one the lungs were larger than natural, in one the right lung was absent, and in seventeen these organs were recorded healthy.

I have records of the state of the liver in twenty-six cases, in sixteen of which it was enlarged, and in four of those enlarged it was congested. Congestion was present in eight other cases, in which no mention is made of the volume. The parenchyma had a natural appearance in nine cases, but in some of these there was enlargement. From these statistics it is probable that the liver is commonly enlarged in cyanosis, and not infrequently congested.

In a few cases the condition of the other abdominal viscera is mentioned; in some as healthy, in others as congested. There were fifteen examinations of the brain, in seven of which congestion is recorded, and in three abscesses in the cerebral substances, in one of which cases the lateral ventricle was also filled with pus; in two there was softening of a portion of the brain, in three the brain was firm or compact, in three the quantity of fluid in the cranial cavity exceeded the normal amount, and in one it was less.

THEORIES RELATING TO THE ETIOLOGY OF CYANOSIS.—Although in nearly all cyanotic patients there are direct communications between the two sides of the heart, it is shown by many observations that these communications or apertures are not sufficient in themselves to produce cyanosis. This opinion was expressed half a century ago by Louis, who published an excellent monograph on the subject of these communications, basing his remarks on an analysis of twenty cases. Since the publication of his paper, the belief has been pretty general in the profession, and observations continue to substantiate it, that, although the apertures may be of considerable size, if the two sides of the heart, with their orifices and vessels, are in their normal state, so that they act symmetrically and without obstruction, cyanosis will not occur. In proof of the correctness of this opinion many cases might be cited of a pervious, and some of a largely dilated foramen ovale without the cyanotic hue, cases which have been published in the journals since the appearance of Louis's monograph. Still, in cases of obstructive malformation, unless the obstruction is complete, cyanosis is more apt to occur in consequence of these apertures, for were they absent a larger amount of blood would be propelled through the narrowed orifice, and a larger amount consequently be oxygenated.

Allusion has already been made to the two theories which prevail in the profession; the one attributing cyanosis to the intermingling of venous and arterial blood; the other to obstruction at the centre of circulation, and consequent venous congestion. There are serious objections to the acceptance of either theory as an explanation for all cases. That admixture of the two kinds of blood is not essential to the production of cyanosis, is apparent from the following facts. In one case in the *Fourth Malformation*, there was no communication between the two sides of the heart, and the ductus arteriosus was closed, so that admixture was impossible. Again, in the *Eleventh Malformation*, or that in which the aorta and pulmonary artery are transposed, the blue disease evidently does not depend on the admixture of the two currents. On the other hand, in this curious state of the heart, the more the admixture the less the cyanosis, since the only way in which the systemic current of blood can be arterialized is by passing to the opposite side of the heart. An argument against this doctrine may also be found in the fact that the modes of compensation are not such as in any way diminish or obviate the admixture. It is admitted that in the more frequent malformations cyanosis is increased by the apertures, which allow the intermingling of the venous and arterial currents, but it is more reasonable to consider the intermingling and the cyanosis as the direct results of the malformation, neither having the precedence of the other, than to consider that they are related to each other as cause and effect, or as proximate and remote results. Viewed in this light, the admixture must be considered simply a concomitant of the cyanosis.

The second theory, that of venous congestion, has numbered among its advocates many who have given special attention to the subject, as Morgagni, Louis, and Stillé, but it seems to have even less claim for acceptance than the theory of admixture. It has been seen that in nearly all cases of cyanosis the two sides of the heart communicate freely, so that if the current of blood meets with an obstruction, as it commonly does, it readily escapes to the opposite side where the artery is large and gives it free passage. In this way congestion, if not prevented, is greatly diminished. Again, it will be seen that, although certain of the viscera are frequently found at the autopsy more or less congested, congestion is not uniformly present in the organs, as it would probably be were it the proximate cause in all cases of cyanosis.

Moreover, in some patients the malformation is not obstructive. The cavities and their orifices are of the normal size, and cyanosis is due entirely to malposition of the vessels. It cannot be said that in these cases there is venous congestion from arrest at the centre of circulation. If there is any congestion, it must be due to the fact that venous blood does not circulate as readily as the arterial in the capillaries. It is true that in the paroxysms of dyspnœa there is sometimes more or less congestion; the distension of the jugulars shows this, but it subsides with the paroxysms, and is probably no more than usually occurs when the respiration is greatly embarrassed.

In fine, attempts to express the immediate pathological state producing cyanosis in the terms of a general la
However plausible the above theories may

certain cases, there are others to which they are manifestly inapplicable. Those who advocate these theories seem to lose sight of the obvious fact that the chief want of the economy in cyanosis is arterialization of the blood, and it is hardly supposable that there can be any correct theory of its causation which is not founded on this fact. With this want of the economy in view it does not seem difficult to express a theory in comprehensive terms which is applicable to all cases, such as the following: *Cyanosis is due to vices or defects in the organism, usually congenital, which prevent the free and regular flow of blood to, through, or from the lungs.* So comprehensive a statement includes not only cases of malformation and malposition of the heart and its vessels, but also those few cases in which the lungs are in fault. In most patients, as we have seen, the current of blood *towards* the lungs is obstructed, and the current of blood *from* the lungs, in those comparatively rare cases in which the malformation is on the left side.

TREATMENT.—From the nature of cyanosis, it is evident that the treatment should be more hygienic than medicinal. The patient should be warmly clad and kept in a warm room, and all agencies calculated to embarrass or disturb the functions of the body or excite the emotions, and thereby accelerate the action of heart, should be studiously avoided. The diet should be nutritious, but simple and easily digested.

Those who have attributed cyanosis wholly to apertures in the inter-auricular and inter-ventricular septa, and the consequent flow of blood from the right to the left side of the heart, have considered it an important part of the treatment to keep the patient reclining on the right side, so as to diminish this flow by the effect of gravitation. The reader, however, must be convinced from the nature of the malformations that little benefit can accrue from following such advice. Still, patients are sometimes less cyanotic and more comfortable in one position than another. In a case reported by Mr. Howship (*Edin. Med. Journ.*, 1813) "the only easy and indeed comfortable position in which the child could remain was that usual in nursing. When erect, the dusky color of the face and neck became a dark blue." In a case related by Mr. Spackman (*Lond. Med. Gaz.*, 1833), the patient was easiest on the hands and knees. Louis reports a case (*de la Commun. des Cav., etc.*) in which the selected position was with the head elevated; Wm. Hunter a case (*Med. Obs. and Enq.*, vol. vi.) in which the patient avoided paroxysms by lying on the left side. Struthers and King each reports a case in which the patients seemed most comfortable while lying on the right side (*Monthly Journ. of Med. Sci.*), while, on the other hand, Prof. White of Buffalo (*Buf. Med. Journ.*, 1855), and Dr. Jas. Carson (*Amer. Journ. of Med. Sci.*, 1857), report cases in which position on the right side failed to produce any alleviation of symptoms. Other similar observations might be cited, but enough have been mentioned to show that no one position should be recommended for cyanotic patients. Some obtain most relief by lying on the back, others on the right side, others on the left, some when on the hands and knees, some when reclining on either side indifferently, while, finally, others suffer least when erect.

There was a time when the paroxysms were treated by venesection, but depletion has long since been abandoned. Physicians now rely on stimulants, antispasmodics, friction to the chest, and mustard pediluvia to relieve the urgent symptoms, although this treatment is but partially successful.

SECTION V.

SKIN DISEASES.

CHAPTER I.

ERYTHEMATOUS DISEASES.

UNDER this head are included erythema, roseola, and urticaria. They consist in an active congestion, inflammatory it is believed, of the skin, which soon declines, with or without slight furfuraceous desquamation. The color of the affected cuticle is a bright red in erythema, rosy in roseola, and a pale red in urticaria. Febrile symptoms often precede for a few hours the occurrence of the eruption, and abate as it appears.

Erythema.

The eruption of erythema occurs in patches of different sizes, the largest ordinarily not exceeding four or five inches in length and most of them have considerably smaller dimensions, their margins being in some instances diffused, and in others circumscribed and well defined. The patches are slightly swollen from engorgement of the capillaries of the skin and slight serous effusion, and are accompanied by a sensation of heat and itching.

Erythema is idiopathic or symptomatic. The *idiopathic* form is subdivided into erythema simplex, intertrigo, and læve. Erythema simplex is produced by external agencies of an irritating nature, as heat, cold, friction, chemical and mechanical irritants, applied to the skin. A common example of this form of the disease is the efflorescence about the anus in cases of infantile diarrhœa due to acidity of the evacuations. Erythema intertrigo is produced by the friction of opposing surfaces of the skin, and it therefore occurs mainly in the folds of the neck, about the groins, and behind the ears. This inflammation is sometimes slight, disappearing in two or three days with proper treatment; in other cases the epidermis becomes denuded, the surface is tender and moist, and even superficial excoriations occur. In severe cases the ulcers extend more deeply, and give rise to considerable purulent discharge, the skin and even subcutaneous connective tissue, being more or less infiltrated and indurated. The confinement of the perspiration, and the moisture, which is exuded between the folds of the skin, increase the inflammation. The effused liquid does not in ordinary cases stiffen linen, as in eczema. Erythema læve is the name applied to the inflammatory hyperæmia of the skin, which often occurs over œdematous parts. Its most common seat is about the ankles and upon the legs. In children it is most frequently observed in the œdema which results from scarlatinous nephritis and from heart disease.

Symptomatic erythema, which results from a general or constitutional cause of a pyrexial character, has several subdivisions. The simplest and mildest form of it is erythema fugax, which comes and goes quickly. The erythema which occurs upon the features in acute meningitis is a typical example. It is common in various inflammatory and febrile affections. If the erythematous patch is circular, with normal skin in its centre, it is sometimes designated erythema circinatum, and if the margin is well defined, marginatum. Erythema papulatum, tuberculatum, and nodosum are applied to the same form of the disease, one or the other term being employed according to the stage or size of the eruption. In erythema papulatum the eruption begins as small red spots, which soon become papular, and attain a size varying from that of a pin's head to a split pea. It occurs especially on the neck, breast, arm, and back of the hand, and fades away, with a slight desquamation, in about three weeks. In erythema tuberculatum and nodosum the eruptions have a greater diameter, and are usually more prominent. In the latter variety they often have a diameter of two or more inches, and occur most frequently upon the anterior aspect of the leg. These three forms of erythema, which might be described as one, occur chiefly in young people. Erythema tuberculatum is most common in servants, especially those recently from the country. The tumefaction is due to the effusion of serum in the corium, and, when the eruption has considerable prominence, also in the subcutaneous connective tissue. The color is at first a bright red, then dark red or purple, and it fades away like the
discoloration of a bruise as the eruption
is often and diarrhœa occasionally associ
erythema, and rheumatic pains are occa
more or less febrile movement.

PROGNOSIS.—This as regards the erythema is always good. An unfavorable result in any case is due to cachexia, or some coexisting disease. The duration of the milder forms is only a few hours, while the severer forms, as erythema nodosum, last two or three weeks.

DIAGNOSIS.—The ordinary forms of erythema are distinguished from *erysipelas*, by the absence of any very decided burning pain, and tumefaction of the integument, and tendency to spread, and by less marked constitutional symptoms. In those forms of erythema in which there is infiltration and swelling of the skin and subcutaneous connective tissue, the patches are distinguished from those of erysipelas by being multiple, of smaller size, less hot and painful, not extending, and presenting as they disappear the phenomena of a bruise. In *urticaria* the wheals that come and go suddenly with a peculiar stinging sensation, and the irritability of the skin by which these wheals can be produced by slight friction, differ in so marked a degree from the symptoms and appearances of erythema that the differential diagnosis of the two is easy. In *roseola* the eruption ordinarily occurs over a large part, if not the entire surface, in points and small patches with healthy skin between, and presenting a rosy instead of a bright-red color, characters which sufficiently distinguish it from erythema. Erythema when extensive is sometimes mistaken for the scarlatinous eruption, but the redness of the fauces, graver constitutional symptoms, vomiting, persistence of the eruption, etc., serve to distinguish the latter from the former affection. In cases of doubt it is proper to defer the diagnosis for a day or two, when if the rash is erythematous it will fade. Erythema sometimes occurs in the initial stage of variola, when on account of the grave general symptoms it may be mistaken for scarlatina. I have more than once known this mistake to be made in the hurried visit of the physician. A more careful examination would prevent this error. There is little danger of confounding erythema with measles, or the various papular, vesicular, or pustular skin diseases.

TREATMENT.—Erythema fugax requires no special treatment, unless occasional dusting the surface with lycopodium or powdered starch. Those forms of erythema which are due to a mechanical or chemical irritant soon disappear when the cause is removed. In erythema around the anus, produced by the irritation of the urinary and alvine evacuations, the diaper should be changed as soon as soiled, and if the stools are frequent and acid, the alkaline treatment proper for the diarrhœa is useful also for the erythema.

In inflammation from this cause as well as in erythema intertrigo, the following prescriptions will be found beneficial:—

℞. Pulv. zinci oxid.,
Lycopodii, āā. equal parts. Misce.
To be frequently dusted upon inflamed surface.

℞. Zinci oxid. ʒij;
Glycerinæ ʒij;
Liq. plumb. subacetatis ʒjss;
Aquæ calcis ℥vj to viij. Misce.

In obstinate cases a weak solution of nitrate of silver, sulphate of copper, or, better, as it does not stain the linen, sulphate of zinc, will frequently be followed by immediate improvement.

℞. Zinci sulphat. gr. vj;
Glycerinæ ℥ij;
Aq. rosæ ℥iv. Misce.
To be constantly applied between the folds of the skin on linen.

Chlorate of potash, internally, to correct the acidity of the transpiration from the skin in protracted and obstinate cases, and in certain instances cod-liver oil and the syrup of iodide of iron, are called for. If the derangement of the system, upon which the erythema depends, appears to be of a rheumatic character, colchicum or alkalies may be required. Erythema papulatum, tuberculatum, and nodosum occur most frequently in reduced states of the system, and therefore require tonics.

Roseola.

The term roseola is applied to rose-colored spots or patches of greater or less extent, accompanied by a degree of febrile reaction, and often by redness with little or no swelling of the faucial surface. It is attended by a sensation of warmth and slight itching. The following groups and subdivisions embrace the recognized varieties of this disease.

ROSEOLA.

Idiopathic.	*Symptomatic.*
Infantilis.	Variolosa.
Æstiva.	Vaccinia.
Autumnalis.	Miliaris.
Annulata.	Rheumatica.
Punctata.	Arthritica.
	Cholerica.
	Febris continuæ.
	Syphilitica.

The color of the eruption gradually fades from a rose red to a duller hue, and often disappears in two or three days. In other instances the eruption lasts a week or more. Roseola may occur in any season, but it is most common, especially the idiopathic form, in the warm months. Those varieties of the idiopathic disease which are designated infantilis, æstiva, and autumnalis are the most common in early life. They are in reality indentical, or nearly so, and may be described as one disease.

SYMPTOMS.—Roseola infantilis, æstiva, or autumnalis may be partial, appearing upon the arms and legs, or general. It is often preceded by febrile movement, languor, and in those old enough to describe their sensations, pain in head, back, and limbs. There is great difference, however, in different cases as regards the severity of the prodromic symptoms. They may be absent or so slight as scarcely to be appreciable. Occasionally vomiting, diarrhœa, or other symptoms of derangement of the digestive apparatus immediately precede the eruption.

The eruption of roseola, when general, usually commences upon or about the neck and face, and in the course of twenty-four to thirty-six hours appears upon the rest of the surface. It bears considerable resemblance to that of measles. The patches are irregular in shape, a quarter to half an inch in diameter, and, though of a rose color at first, they soon present a dusky hue as they begin to fade; by pressure the redness disappears. In the majority of cases the eruption has nearly faded by the fifth day. The redness of the faucial surface, together with the itching or tingling, disappears with the subsidence of the rash.

Roseola annulata is a rare disease. It commences with constitutional symptoms, which are slight or pretty severe, and which cease when the eruption appears. This occurs in the form of red circular spots, which enlarge to the diameter of an inch or thereabout and assume the shape of rings inclosing healthy skin. The rash fades in a few days, often leaving a bruised appearance. The ordinary location of this form of erythema is upon the abdomen, and about the thighs. In roseola punctata the eruption is of small size, and it occurs upon a large part of the surface.

Symptomatic roseola, which appears in the course of various diseases, need only be alluded to. The diseases in which it is developed are, with the exception of syphilis, chiefly of an acute febrile or inflammatory character. This eruption is often really, as stated by Tilbury Fox, a rose-colored erythema, but in other instances it presents the typical form and appearance of roseola. Thus

I have known it to occur about the eighth or ninth day of vaccinia in rose-colored spots over the whole surface, and producing much anxiety on the part of parents, lest impure virus had been employed.

CAUSES.—These are in a measure obscure. The delicacy of the skin in infancy and the active cutaneous circulation no doubt predispose to roseola and erythema, and hence the frequency of their occurrence in acute febrile and inflammatory affections. Summer weather, with the derangements of system which it produces, has been in my experience much the most frequent cause of idiopathic roseola in young children in this city. In certain summers, as in that in 1868, a large proportion of the infants have been affected by it, and I have been led to consider it a favorable prognostic sign as regards the diarrhœal affections, which are so common in the warm months.

PROGNOSIS.—Roseola is always a mild and favorable disease.

DIAGNOSIS.—Roseola is distinguished from measles by the absence of catarrhal symptoms, the less degree of fever, less uniformity in the size of the eruption, and the absence of any history of contagion. Roseola is distinguished from erythema by the smaller size of the eruption and its rosy or dusky red color. The boundary line, however, between the two affections is not well defined, and certain forms of roseola might be described as erythema. The general but punctiform efflorescence, increase of temperature, acceleration of pulse, and the peculiar appearance of the tongue and fauces, serve to distinguish scarlet fever from roseola. There is little danger of confounding roseola with urticaria, since the wheals of the latter appear in no other disease.

TREATMENT.—This is simple. If roseola occur in connection with gastro-intestinal derangement or disease, the remedies which relieve the latter exert a curative effect upon the former. In all cases the state of the system should be inquired into, and any departure from a state of health corrected. Roseola needs no farther constitutional treatment. If there is itching or tingling of the surface, a lukewarm lotion, containing equal parts of liq. ammon. acetat. and mistura camphoræ, has been recommended, or a lotion containing a drachm of hydrocyanic acid to a pint of an emulsion of bitter almonds, used warm. The purpose of such lotions is simply to relieve the unpleasant sensation. Cold applications, or others which would repel the eruption, should be avoided; such an effect might be injurious. In cases of acidity of stomach alkaline remedies are useful, and in certain cases tonic treatment is indicated.

Urticaria.

The name by which this disease is designated is derived from the term *urtica*, the nettle, the sting of which produces this form of eruption. The eruption occurs suddenly in wheals or pomphi, attended by tingling and burning, and suddenly disappearing. Urticaria is often accompanied by no very decided general symptoms, but in other cases there are febrile movement, and lassitude, with perhaps epigastric pain and headache. The wheals may occur over the whole body, but more frequently are confined to a portion of it. Their shape may be round, oval, irregular, or bandlike, and their length varies from a few lines to several inches. In one affected by urticaria the wheals can be readily produced by scratching or rubbing the surface. The eruption is thus clearly described by a recent writer: "At first a bright flush appears, the centre of this becomes slightly elevated, and pales, hence appears of lighter color; the tint may be rosy, but more generally it is whitish." The margin of the wheal, the diameter of which varies, always remains red. This eruption appears to be produced by active congestion of the cutaneous capillaries, some serous effusion, and spasm of the muscular fibres of the skin. The effusion of serum in certain localities is quite apparent from the œdema which occurs. The subsidence of the eruption is without desquamation. Urticaria is ordinarily an acute disease. It is sometimes chronic in the adult, but rarely so in children. Several varities of it are described by dermatologists, according to the cause, appearance, and duration.

Causes.—These are external and internal. Various irritants apart from the nettle applied to the surface produce the wheals, as the bites of certain insects and sometimes turpentine. The following are the principal internal causes, as summarized by Hillier: 1st, profound and sudden mental emotion; 2d, certain articles of diet, as shell-fish, pork, sausage, cheese, etc.; 3d, certain medicinal substances, as copaiba, valerian, and turpentine; 4th, intestinal worms, though it is probable that these seldom operate as a cause; 5th, uterine ailments, as hysteria.

Prognosis, Diagnosis.—The prognosis is good, though the chronic form is sometimes tedious and troublesome. The occurrence of the wheals and the possibility of producing them by friction serve to distinguish this disease from all others.

TREATMENT.—In urticaria due to any recent ingesta of an irritating or indigestible character, an emetic of ipecacuanha is useful, followed by a saline, and better also alkaline aperient, as Rochelle salts. An aperient of this character is useful ordinarily in acute cases, attended by febrile reaction. The diet for several days should be simple, and such as is readily digested, as fresh beef, bread, or other farinaceous food, and milk. Occasionally the wheals appear periodically, when a few doses of quinine effect a prompt cure. After the above measures have been employed, the subsequent treatment, whether tonic or otherwise, depends on the condition of the patient. Little benefit accrues from local measures. Sponging the surface with cool water to which a little vinegar is added relieves, in a measure, the heat and tingling of the wheals.

CHAPTER II.

PAPULAR DISEASES.

THE three papulæ, namely, lichen, prurigo, and strophulus, which are characterized by small and firm elevations upon the skin, occur in children; but the two former are not common, and, as they do not differ in any essential particular from the same diseases in the adult, they will not be treated of in this connection. Strophulus, on the other hand, is a disease peculiar to children. It is known as the red gum or white gum according to its appearance, and also as the tooth rash. This eruption appears usually on parts which are exposed, as the face, neck, and extremities; the papules being in some patients of the size, or even smaller, than a pin's head, while in other cases they are as large as a millet-seed.

The varieties of strophulus described by dermatologists are:—

S. intertinctus.
“ confertus.
“ albidus.
S. candidus.
“ volaticus.
“ pruriginosus.

The following are the characters of these varieties: S. intertinctus, papules a bright red, and occurring chiefly upon the cheeks, forearm, and back of hand; often *intertinctured* with blushes of erythema; it lasts from two to four weeks, and is most common in young infants. S. confertus, papules numerous, and closely aggregated, paler, continuing longer than in strophulus intertinctus, and likely to recur, appearing about the time of dentition, and most frequently upon the arm. Sometimes certain of the patches become chronic, slowly disappearing, and leaving the skin rough and dry. S. volaticus appears usually upon the arms and cheeks in patches of about a dozen, fewer or more, papules, which soon disappear. These patches reappear at intervals for two or three weeks, and are attended by heat and itching, though not intense. S. albidus, so called, should really be placed among the diseases of the sebaceous glands, and described under another name. It appears in the form of small white elevations as large as a pin's head, commonly upon the face and neck, and produced by distension of the sebaceous glands with the secreted product. The term strophulus candidus is applied to large whitish papules, which appear upon the sides of the trunk, shoulders, and arms of infants of one year or thereabouts, and disappear in about one week. They are apt to be associated with the papules of strophulus confertus. S. pruriginosus is really a form of lichen, occurring chiefly over the age of one, and under that of eight or nine years. The papules, which are small and discrete, usually appear over a large extent of surface, ordinarily upon the back, front of the chest, the face and arms, and, as they are scratched from the itching, minute dark points of blood collect and dry upon their apices. This form of strophulus is more protracted than the others, and, in consequence of the irritation produced by the scratching, pustules of ecthyma often occur among the papules. The apparent cause of strophulus pruriginosus is a mode of life which impoverishes and vitiates the blood, such as uncleanliness, residence in damp, dark, overheated, and overcrowded apartments. Atmospheric heat also operates as a cause, and it is a not infrequent disease in the cities during the summer months.

The various eruptions included under the term strophulus have such different anatomical characters, that a proper classification would locate some of them in other groups of skin diseases. One form of it, as we have seen, is produced by distension of the sebaceous glands; in other and the majority of cases, as appears from the recent observations of Mr. Fox, its seat is the sweat glands, and in others still the papillary layer of the skin as in lichen, the papules being produced by an exudation.

TREATMENT.—Personal cleanliness, with frequent change of linen, and daily ablution without the use of soap, should be enjoined. Local irritants, which might aggravate or cause the disease, should, so far as practicable, be removed. Alkalies in cases of acidity of the *primæ viæ*, and occasionally mild aperients, are required; the food should be bland, but nutritious, and if the child is nursing, it may be necessary to attend to the health of the wet-nurse. Favorable hygienic conditions important for the successful treatment of all forms of strophulus are especially required in strophulus pruriginosus. Nutritious diet, fresh air, quinine, iron, cod-liver oil, etc., should be prescribed for those affected by it. The following formula is recommended for sponging the surface in cases of strophulus:—

℞. Sodæ carbonat. ℈j;
Glycerinæ ʒij;
Aq. rosæ ℥vj. Misce.

CHAPTER III.

ECZEMA AND SCABIES.

Two other forms of cutaneous eruption should be treated of among the diseases of children, since they are much more frequent in them than in adults, although they occur at any age. The diseases alluded to are eczema and scabies, both placed by dermatologists in the group of vesiculæ.

Eczema.

This is one of the most common inflammatory affections of the skin. It constituted one-third of Devergie's cases and one-sixth of Hillier's. It is, as remarked by Niemeyer, the analogue of catarrh of mucous surfaces. It is accompanied by a discharge of a serous appearance, which, confined at first by the epidermis, usually lifts it at numerous points, forming small vesicles. The vesicles are fragile, soon rupturing, and as they disappear the surface underneath is seen to be red and abraded. The fluid has the property of stiffening linen, and as it dries it is succeeded by a crust of moderate thickness and a light-yellow color. The crusts are composed mainly of inspissated pus and epithelial cells intermixed with granular matter.

Eczema is attended by a sensation of
vesicles may appear only at the comm
is not entirely destroyed there may
the epidermis is destroyed, or do

power, the liquid escapes immediately on the free surface, and vesicles are not produced. The discharge is irritating, and the contiguous surface with which it happens to come in contact is usually irritated and reddened by it. While these superficial changes occur, the deeper portions of the integument become thickened and infiltrated.

Eczema occurs in various parts of the body, and it is sometimes designated, according to its locality, as *faciei*, *capitis*, etc. In its acute stage it is usually attended, especially if the patches are of large size, with febrile movement. The patient ordinarily presents a pallid, cachectic, or strumous aspect, has a poor or capricious appetite, slightly furred tongue, and disordered, usually constipated bowels; but the general condition and the symptoms vary considerably in different cases.

There are three varieties of eczema, namely, simplex, rubrum, and impetiginodes. Eczema *simplex* is most common in the summer months, being produced by the heat of the atmosphere. External irritants, applied to the skin, as strong soap, sometimes cause it. The patient complains, perhaps, of febrile symptoms, and soon an erythematous patch of greater or less extent appears, upon which a cluster of the vesicles of eczema arise. These break, forming slight crusts, which are soon detached, and the disease declines, or it may continue longer, with a successive eruption of vesicles.

Eczema *rubrum* is a more severe form of the disease. The fever and the local symptoms are greater than in the preceding variety, and the eczematous patch presents the appearance of a more intense inflammation. The vesicles, which are often so minute as to be with difficulty recognized, and so numerous as to become confluent, are soon ruptured, and their contents, with the secretion and exudation from the surface, dry into yellowish or brownish-yellow scabs. The discharge is more irritating, as it is more abundant, than in eczema simplex, and the adjacent skin usually is inflamed from its contact. Its most common seat is about the flexures of the body, but it not infrequently extends to a greater or less extent along the surface.

Eczema *impetiginodes* is common in young, debilitated children, in whom, in consequence of the cachexia, inflammations, of whatever character, are apt to be suppurative. This form of eczema presents at first the symptoms and features of eczema rubrum, but the transparent liquid of the vesicles soon becomes opaque, from the generation and admixture of pus corpuscles. The crusts, which form from the rupture and desiccation of the vesiculo-pustular eruption, are thick and greenish-yellow, and in infants the sebaceous glands, which are involved in the inflammation, pour out an abundant secretion, increasing the thickness of the crusts. This form of eczema is most common in infancy, and its usual seat is upon the scalp.

Other varieties of eczema are described by writers. When the inflammation does not entirely abate, but sufficient of it remains to cause scaliness, it is designated *squamosum*. This form may continue many months. Eczema may also become chronic, with a free and irritating discharge, the eczema ichorosum of authors. When eczema is severe, or protracted, various structural changes occur in the inflamed integument, as fissures, œdema, papillary or warty out-growths, hyperplasia of the connective tissue, and subvarieties of the disease are described by writers, according to these characters. It is seen, therefore, that there is considerable variation in the appearance of an eczematous eruption, but its distinctive feature is the occurrence of a discharge of a serous appearance from the inflamed surface, which lifts the cuticle, and appears to the eye in the form of minute vesicles. This discharge is sometimes insignificant, almost absent, but the form of the vesicles, although they may abort, can be made out in the commencement of nearly all cases.

The eczema of infants is of most interest to us, as it is not only so common, but is one of the most troublesome of the cutaneous affections. It is really in its commencement in most cases an eczema simplex, or rubrum, or a combination of the two. Its seat is upon the scalp, behind the ears, upon the face, and in the flexures of the joints. Unless properly treated, it frequently becomes chronic, lasting several months, being usually, when protracted, an eczema impetiginodes. The health of the child after a time suffers. It becomes more pallid, its flesh more soft and flabby, and the appetite impaired. The heat, itching, and pain increase the discomfort.

Diagnosis.—Eczema presents in different instances so different an appearance that it is not always readily diagnosticated. It will aid in its diagnosis to recollect that it is in its nature a moist disease, affecting primarily and chiefly the upper portion of the derma and the malpighian layer, and
present a dry or scaly appearance (E
will show that there has been a di
proportion of cases, the physi

since they are fragile and transient, breaking in the first thirty-six hours, and not reappearing. Still, when vesicles are absent, we sometimes observe around the margin of the patch an appearance which indicates that they have been there. Their minuteness is occasionally such that they may escape notice, on a cursory inspection, when they are present and well defined. Acute eczema, affecting a considerable extent of surface, is attended by decided febrile movement, and might be mistaken for one of the eruptive fevers, but the absence of certain distinctive appearances, which characterize these fevers, and the speedy appearance of vesicles and moisture, establish the diagnosis. Eczema can be readily diagnosticated from ordinary erythema, which is a superficial inflammation without moisture. The location of erythema intertrigo serves for its diagnosis, as it is evidently produced by the attrition of opposite surfaces of the skin. Moreover it lacks the vesicular eruption, and the discharge does not stiffen linen like that of eczema. Lichen, when acute, presents some resemblance to eczema, but it is dry and papular, the papules though small being detected by the finger as well as sight. The large and irregular phlyctæna, intense inflammation, and œdema, and mode of extension of erysipelas, large, scattered, and non-inflammatory vesicles of sudamina, scattered and accuminate vesicles, without surrounding inflammation of scabies, are so different from the eczematous eruption that the differential diagnosis is readily made. Herpes circinatus can be distinguished from eczema by its circular shape, larger size, and greater permanence of the vesicles, and the delicate, branny scales, which consist rather of epithelial cells than the product of exudation as in eczema.

TREATMENT.—Hardy believes that there is a diathesis which manifests itself in certain cutaneous eruptions, especially eczema, pityriasis, psoriasis, and lichen. This diathesis he designated dartrous, and those who have it may seem to have good general health, but not in reality. Their skin is readily affected by irritants; it is dry, the perspiration being deficient, and it is liable to pruritus. The dartrous diseases of the skin are non-contagious, often hereditary, prone to reappear and invade new portions of the surface, protracted in their nature, accompanied by itching, and healing without cicatrization. According to this theory, therefore, the predisposing cause of these diseases is to be found in the diathesis, or the state of the blood, but in ordinary cases there are certain exciting causes, which may be found in the occupation, mode of life, or hygienic conditions. The mucous surfaces are often also affected, a dartrous bronchitis, leucorrhœa, etc., occurring. Such is the theory of Hardy and the French school.

That there is in a large proportion of cases of eczema, and of the other diseases alluded to above, a diethetic state by whatever name known, underlying and causing the eruption, is not, however, a new belief; and hence the term herpetic diathesis, or dyscrasia, by which this state has long been designated. Not infrequently, especially among the city poor, eczema is obviously one of the protean manifestations of the scrofulous diathesis, the eruption disappearing under anti-strumous remedies. It is a matter of importance as regards the therapeutics to recognize a constitutional cause in eczema, whether it be a diathesis, or, as is not infrequently the case, is of a more transient nature, the result of some influence, which temporarily impairs the health. But while it is, therefore, apparent that internal treatment is ordinarily required for the successful treatment of eczema, there are certain cases in which the system is not in fault, and local measures alone are required, as when the eruption is due to the direct effect of the sun's rays, or friction.

GENERAL TREATMENT.—In most recent cases of eczema, great benefit results from an occasional purgative dose. This is most useful in the sthenic cases, when accompanied by considerable pyrexia, a full pulse and troublesome pruritus. An occasional dose of calomel, or a saline purgative, should be given. By its derivative effect it diminishes the intensity of the cutaneous inflammation, and the patient experiences a degree of relief from the itching. In feeble infants the hydrarg. com. cretæ, followed by syrup of rhubarb, is sometimes preferable. The purgative often requires to be repeated once or twice weekly.

If the child is scrofulous, the proper internal remedies for daily use are cod-liver oil, and the syrup of the iodide of iron. The constitutional state, whatever its exact character or cause, is most frequently one of debility, and therefore tonics, vegetable and ferruginous, are useful. We have in addition one internal remedy, the value of which is acknowledged by all dermatologists, namely arsenic. Wilson regards it a specific for this disease. The following is the formula which he recommends, and which will be found useful for ordinary cases:—

℞. Vini ferri,
Syrup tolutani, āā ℥ss;
Liq. potas. arsenit. ♏ xj
Aquæ anethi ℥j. M

Dose, one drachm, with or after the meals, three times daily. An infant from six to twelve months old can take from one to two minims of Fowler's solution. Prominent among the immediate and preventible causes of eczema is some error of diet. If the patient is a nursing infant, the state of the health of the wet-nurse should be attended to, and if it is in fault, she should be placed upon tonic or other treatment. "If," says Mr. Fox, "the child is being brought up by hand, corn flour, and other purely starchy compounds, I think should be avoided. Fine baked flour, and milk wheat phosphates, is perhaps the best compound."

Local Treatment.—As the skin in eczema is in an inflamed and sensitive state, and easily irritated, soothing local treatment is required in recent or acute eczema. In the commencement of the eruption, one of the following formulæ will be found useful:—

℞. Liq. plumbi subacetat.,
Vini opii, āā ʒj;
Ung. sambuci ℥j.

To be applied frequently over the eczematous patch. Simple cerate may be used in place of the orange flower ointment:—

℞. Gum camphor ʒss;
Alcohol q. s. Misce.
Adde
Zinci oxid.,
Pulv. amyli, āā ʒiv.

To be dusted upon the surface. This powder is useful both in treating the eruption and for the burning sensation. A simple water dressing, or bathing with milk and water, is also useful, when the inflammation is in its first stages, and active, and the local symptoms are severe. The following prescription employed by Mr. Fox is also beneficial in such cases:—

℞. Sodæ borat. ℈ij;
Zinci oxid. ʒj;
Liq. plumb. subacetat. ʒij;
Aq. calcis ℥vj to ℥viij. Misce.

When the eruption has continued for a little time, and the pyrexia and local symptoms are somewhat moderated, the preparations of zinc are most highly esteemed for local treatment both in this country and in Europe. In Germany, on the other hand, preference is given to the milder mercurial ointments, as the white precipitate, considerably diluted. But the result of the zinc treatment is ordinarily satisfactory, and it should always be employed, when the eruption involves a considerable extent of surface. After the crusts have been softened by a poultice or glycerine, and to a considerable extent removed, the following ointment should be thickly applied to the surface, two or three times daily. No soap or other irritant should be employed after the treatment has been commenced, but any bathing which may be required should be by simple water, milk and water, mucilaginous water, or bran water. The following is also a good formula for ordinary cases of eczema:—

℞. Zinci oxid. ʒij;
Glycerinæ ℥j;
Liq. plumbi subacetat. ʒjss;
Aquæ calcis ℥viij. Misce.

If the burning and itching remain a troublesome symptom, notwithstanding this treatment, one of the following washes may be frequently applied in addition:—

℞. Potas. cyanid. gr. xxiv;
Aquæ ℥viij. Misce.

℞. Sodæ borat. ʒij;
Aq. lauro-cerasi ℥j;
Aq. sambuci ℥jss. Misce.

℞. Liq. ammoniæ acetat, 1 part;
Aq. camphoræ, 2 parts. Misce.

If the above treatment fail to relieve eczema, or if the improvement is slow and unsatisfactory, the ointment of the nitrate of mercury, or of ammoniated mercury, will frequently produce speedy improvement and cure. I have noticed the most benefit from it in chronic cases, in which the amount of inflammation was quite moderate. Niemeyer says, "The topical remedies, which I would recommend before all others, are the white precipitate in the form of an ointment (hydrarg. ammoniat, ʒj adipis ℥j) and corrosive sublimate in weak solution (hydrarg. bichlor. gr. j–ij, aquæ destillat. ℥j), . . . since in the great majority of cases they amply suffice to effect a rapid and complete cure, even of the most obstinate forms of eczema." The preparations of lead and zinc, he believes, "stand next in virtue to the white precipitate salve, and the solution of corrosive sublimate," as remedies for eczema. In the foregoing remarks no allusion has been made to those cases of eczema which are due to the syphilitic dyscrasia. Evidently mercurials are essential to the successful treatment of this form of the disease, and the white precipitate, citrine, or simple mercurial ointment, properly diluted, should always be prescribed for local treatment of such cases instead of the preparations of zinc or lead (Art. Syphilis).

Scabies.

The diseases of the skin previously considered are non-contagious. Scabies, on the other hand, is one of the most contagious diseases by contact. It is produced by an animal parasite, known as the itch-mite, or *acarus scabiei*. The inflammation is caused by the female only, which burrows, making for itself a canal, or cuniculus, in which its eggs are deposited. The male does not burrow, but conceals itself under the scales or crusts which result from the inflammation produced by its partner, or it burrows only sufficiently to produce a covering and shelter. From observations made by Eichstedt, Gudden, and others, the female has been found within half an hour after being placed upon the skin to have concealed herself in the epidermis, and the cuniculus which she constructs is arched and tortuous, and four or five lines in length, shorter or longer. The acarus has the shape of a tortoise. It can when fully grown be detected by the eye as a minute whitish point. The young acarus has six, the mature eight, articulated legs, with suckers upon the two anterior pairs, and hairs on the posterior. The head, which can be elongated or retracted, is provided with two jaws. The upper surface is covered with spines directed back-

Fig. 1.

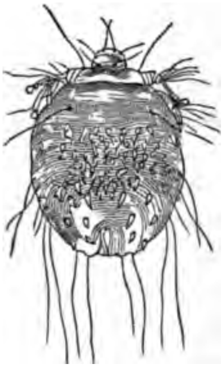


Fig. 2.

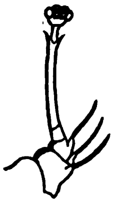


Fig. 3.

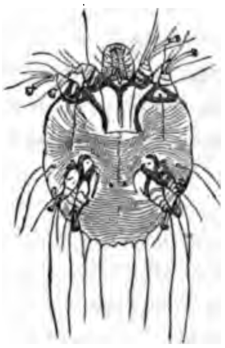


Fig. 4.

Fig. 1. The itch animalcule, acarus scabiei, viewed upon the back, showing its figure and the arrangement of its spines and filaments. The female, which is somewhat larger than the male, has a length of 1-50th to 1-60th of an inch.

Fig. 2. The foot and last joints of the leg of the itch animalcule.

Fig. 3. The male itch animalcule, viewed upon the under surface, showing its legs and lobulated feet.

Fig. 4. Ova of the itch animalcule.

wards so as to prevent retrogression in the burrow. She leaves behind her in the cuniculus, as she advances, her moulted skin, excreta, and eggs, which hatch on the eleventh day. The mother acarus is always found at the remote end of the burrow, where it can be seen by the unassisted eye as a minute whitish or sometimes brownish speck, and from which it can be lifted by the point of a needle to which it clings. The cuniculi can also be seen by the naked eye, looking, says Niemeyer, like the "scars of needle scratches," and containing the young acari in various stages of growth.

The acarus by its burrowing produces an irritation, and troublesome itching, which is the chief cause of the suffering of the patient. At the point where the acarus penetrates the cuticle the inflammation gives rise to a single, small, and accuminate vesicular or papular eruption, the cuniculus extending away from it. We often find ecthymatous pustules and abrasions intermingled with the vesicles, the result of the frequent scratching. The itching is most intense, and the acarus most active, at night, when the patient is warm in bed. Scabies most frequently appears, especially in adults, first upon the hands, between the fingers, where the skin is thin, and it extends thence along the forearm, and over the thighs and abdomen. In children it not infrequently occurs upon the buttocks, thighs, feet, etc., while the hands and forearm escape.

DIAGNOSIS.—Correct diagnosis is important, because the treatment required is different from that in any other exanthem, and because the suspicion of having this disease always renders one solicitous to know the exact nature of the eruption. Scabies can be diagnosticated from those diseases for which it might be mistaken by the following characters: its occurrence where the cuticle is thin and delicate, as between the fingers, along the anterior aspect of the forearm, upon the abdomen, thighs, and inside of the feet; small size, accuminate shape, and isolated position of vesicles; the intermingling with the vesicles of other forms of eruption, as papules and pustules, and the presence of linear scars and abrasions produced by the scratching; itching most intense at night; absence of fever; absence of the disease from posterior aspect of body and arms, and from head and face. Scabies may be distinguished by the vesicular character of the eruption from all other exanthematic affections except eczema, sudamina, and herpes. Eczema is most common on the scalp and face, where scabies does not occur, and unlike scabies its vesicles are round and thickly aggregated in clusters; in eczema there is a smarting or prickling sensation very different from the intense itching of scabies. In herpes the vesicles are large, rounded, and in clusters, and attended by a burning or pricking sensation, with but little itching. The eruption in sudamina is vesicular and discrete, as in scabies, but it is globular, and accompanied by no itching or other local symptoms.

TREATMENT.—As scabies is due to a species of acarus which burrows in the epidermis, it can only be treated successfully by measures which destroy this animalcule. If it is destroyed, the disease gets well of itself. Sulphur has been employed for a long period for this purpose, since sulphurous acid, which is evolved from the sulphur, is destructive to the animalcule. The unguentum sulphuris, if thoroughly applied, will rarely fail to eradicate the disease. The internal use of sulphur aids the external treatment, since a portion of the gas which is generated escapes through the pores of the skin. The chief objection to the employment of sulphur is its exceedingly unpleasant odor, which is noticeable, however disguised by perfume. Sulphur or any other substance employed externally has more effect if it is preceded by a bath, which softens the epidermis, and therefore favors the entrance of the remedy into the pores of the skin and the cuniculi.

Helmerich's ointment is very effectual in the treatment of scabies. It consists of two parts of sulphur, one of carbonate of potash, and eight of lard. "M. Hardy afterwards perfected the method, so as radically to cure the disease in two hours. He proceeds in the following manner: The patient first undergoes a friction of his whole body for half an hour with soft soap, in order to cleanse the skin and break up the burrows; a warm bath of an hour's duration follows, during which the skin is thoroughly rubbed, in order to complete the destruction of the burrows; after which frictions for half an hour and upon the whole surface are practised with Helmerich's ointment. This completes the cure. Out of four hundred patients subjected to this treatment, only four returned to the hospital." (Stillé's *Therapeutics, etc.*, vol. ii. page 516.)

M. Albin Gras experimented with different substances, in order to ascertain their relative destructiveness to the acarus. The following table gives some of the results of his experiments:—

Immersed in pure water the acarus was alive after three hours.
" saline " " moved freely after three hours.
" Goulard's solution the acarus lived after one hour.
" olive, almond, or castor oil the acarus lived more than two hours.

wards so as to prevent retrogression in the burrow. She leaves behind her in the cuniculus, as she advances, her moulted skin, excreta, and eggs, which hatch on the eleventh day. The mother acarus is always found at the remote end of the burrow, where it can be seen by the unassisted eye as a minute whitish or sometimes brownish speck, and from which it can be lifted by the point of a needle to which it clings. The cuniculi can also be seen by the naked eye, looking, says Niemeyer, like the "scars of needle scratches," and containing the young acari in various stages of growth.

The acarus by its burrowing produces an irritation, and troublesome itching, which is the chief cause of the suffering of the patient. At the point where the acarus penetrates the cuticle the inflammation gives rise to a single, small, and accuminate vesicular or papular eruption, the cuniculus extending away from it. We often find ecthymatous pustules and abrasions intermingled with the vesicles, the result of the frequent scratching. The itching is most intense, and the acarus most active, at night, when the patient is warm in bed. Scabies most frequently appears, especially in adults, first upon the hands, between the fingers, where the skin is thin, and it extends thence along the forearm, and over the thighs and abdomen. In children it not infrequently occurs upon the buttocks, thighs, feet, etc., while the hands and forearm escape.

DIAGNOSIS.—Correct diagnosis is important, because the treatment required is different from that in any other exanthem, and because the suspicion of having this disease always renders one solicitous to know the exact nature of the eruption. Scabies can be diagnosticated from those diseases for which it might be mistaken by the following characters: its occurrence where the cuticle is thin and delicate, as between the fingers, along the anterior aspect of the forearm, upon the abdomen, thighs, and inside of the feet; small size, accuminate shape, and isolated position of vesicles; the intermingling with the vesicles of other forms of eruption, as papules and pustules, and the presence of linear scars and abrasions produced by the scratching; itching most intense at night; absence of fever; absence of the disease from posterior aspect of body and arms, and from head and face. Scabies may be distinguished by the vesicular character of the eruption from all other exanthematic affections except eczema, sudamina, and herpes. Eczema is most common on the scalp and face, where scabies does not occur, and unlike scabies its vesicles are round and thickly aggregated in clusters; in eczema there is a smarting

APPENDIX.

A.

THE modes of preparing milk for infants, which are described in the chapters relating to feeding, are simple, and are therefore preferable to more difficult processes. If the milk thus prepared disagree, other formulæ may be employed which furnish a product more closely resembling human milk. The two following, which are extracted from Routh's *Treatise on Infant Feeding*, are among the best. In both the amount of casein is diminished and of sugar increased. First, Prof. Falkland's method:—

"One-third of a pint of pure milk is allowed to stand until the cream has risen. The latter is removed, and to the blue milk thus obtained, about a square inch of rennet is to be added, and the milk vessel placed in warm water. In about five minutes the curd will have separated, and the rennet, which may again be repeatedly used, being removed, the whey is carefully poured off, and immediately heated to boiling, to prevent its becoming sour. A further quantity of curd separates, and must be removed by straining through calico. In one-quarter of a pint of this hot whey is to be dissolved three-eighths of an ounce of milk sugar; and this solution, along with the cream removed from the one-third of a pint of milk, must be added to half a pint of new milk. This will constitute the food for an infant of from five to eight months old for twelve hours; or, more correctly speaking, it will be one-half of the quantity required for twenty-four hours. It is absolutely necessary that a fresh quantity should be prepared every twelve hours; and it is scarcely necessary to add that the strictest cleanliness in all the vessels used is indispensable."

The second method is that by Mr. Lobb:—

"Half a pint of new milk is set aside for the cream to separate, which latter is removed; and to the blue milk half a teaspoonful of prepared rennet is added; this is placed over the fire and heated until the curd has separated, when it is broken up with a spoon, and the whey poured off. In winter, three drachms of powdered sugar of milk are added to this warm whey; and the whole is mixed with half a pint of new milk. In summer, three drachms and a half of sugar of milk are added, and with the new milk are all boiled together."

I have had no experience in the use of milk prepared by either of these two methods. An objection to the latter process is the boiling, which is believed to impair the quality of milk.

The above formulæ are designed especially for infants who have not reached the age at which it is proper to give farinaceous food. They may also be employed for older infants who are in a state of feebleness, and whose digestive organs are capable of assimilating only the blandest preparations of food.

Meigs, in his treatise on diseases of children (page 267), recommends an article of diet which he states agrees better with the digestive system of the infant than any other kind of food which he has employed. The mode of preparation and the proportions are as follows: "A scruple of gelatine (or a piece two inches square of the flat cake in which it is sold) is soaked for a short time in cold water, and then boiled in a half a pint of water, until it dissolves, about ten or fifteen minutes. To this is added, with constant stirring, and just at the termination of the boiling, the milk and arrowroot, the latter being previously mixed into a paste with a little cold water. After the addition of the milk and arrowroot, and just before the removal from the fire, the cream is poured in, and a moderate quantity of loaf sugar added. The proportions of milk, cream, and arrowroot must depend on the age and digestive powers of the child. For a healthy infant, within the month, I usually direct from three to four ounces of milk, half an ounce to an ounce of cream and a teaspoonful of arrowroot, to half a pint of water. For older children the quantity of milk and cream should be gradually increased to a half or two-thirds milk, and from one to two ounces of cream. I seldom increase the quantity of gelatine or arrowroot."

Baron Liebig has also recommended a soup for infants which he believes to be the best substitute for human milk. By the mode of preparation starch is transformed into sugar and dextrin, a change which, when farinaceous substances are used in the usual way, is effected in the stomach, and thus this organ is relieved from a part of the burden of digestion.

"The following is the best way of preparing this food: Half an ounce of wheaten flour, and an equal quantity of malt flour, seven grains and a quarter of bicarbonate of potash, and one ounce of water are to be well mixed; five ounces of cow's milk are then to be added, and the whole put on a gentle fire. When the mixture begins to thicken, it is removed from the fire; stirred during five minutes; heated and stirred again, till it becomes quite fluid, and finally made to boil. After the separation of the bran by a sieve, it is ready for use. By boiling it for a few minutes, it loses all taste of the flour."—(*Lancet*, January 7th, 1865; *Braithwaite's Retros.*, July, 1865.)

Liebig has succeeded in preparing an article the ingredients of which, and their relative proportion, are very similar to those of human milk. It has, however, twice the consistence of milk, or, as Liebig expresses it, is "the double concentration" of that secretion.

Dr. Hassell, in a communication in reference to this food to the London *Lancet* for July 29th, 1865, says: "It appears to me that the great merit of Liebig's preparation consists in the use of malt flour as a constituent of the food; this, from the diastase contained in it, exercises, when the fluid food or soup is properly prepared, a most remarkable influence upon the starch, quickly transforming it into dextrin and sugar, so that in the course of a few minutes the food, from being thick and sugarless, becomes comparatively thin and sweet."

. . . . "Correct and ingenious as are the principles upon which this food has been designed, yet the directions given for its preparation are certainly open to considerable improvement. Thus, Liebig directs that the malt should be ground in a common coffee mill, and the coarse powder passed through a sieve. This necessitates the subsequent straining of the food, a tedious operation, in order to remove the bran and remaining particles of husk. And further, that the food should be put upon a gentle fire previous to its being finally boiled. Now, a gentle heat may mean almost any temperature nearly up to the boiling point; and since the action of the diastase is destroyed at about 150° F., the temperature should never be allowed to exceed that degree.

"I recommend, therefore, that the malt should be well freed from husk, and finely ground; that the wheat flour should be lightly baked; and finally, that a thermometer should be employed in the preparation of the food. Indeed, in some samples recently submitted to me by Messrs. Savory & Moore, I find that the first two points have been attended to, and that they use malt freed from husk and finely ground, and the wheat flour baked.

"The effect of baking the wheat flour is to partially cook the starch entering into its composition, so that less heat is required in the preparation of the liquid food. I find that a temperature ranging between 140° and 148° is amply sufficient to effect the complete transformation and solution of the starch corpuscles, and, indeed, to cook the food sufficiently."

I have, in some cases, directed food to be given prepared as recommended by Dr. Meigs, but my observations in reference to the effect of it have not been sufficient to enable me to speak confidently in regard to it. Gelatine is of little value as a nutritive substance, but it is the opinion of some that, when combined with farinaceous substances, it renders them less irritating.

Liebig's soup was prepared a few times for the foundlings in the Infant's Service in Charity Hospital. The result did not justify the expectations which had been formed in consequence of the plausibility of the theory, and the reputation of the great chemist. On the first day in which it was used, an unusually large number of the foundlings were observed to vomit. The soup was prepared under the supervision of the matron of the institution. The test was not conclusive, as it is probable that there was some fault in the preparation, or in the materials used. The mode of preparing this soup is too tedious for common use, but it deserves trial in cases in which the ordinary kinds of food disagree.

I have collected the above formulæ on account of the great importance of the use of properly-prepared and digestible food in the regimen of infants, especially those that present symptoms of indigestion. Success in the treatment of diarrhœal affections, and of all infantile diseases which are attended by feebleness of the digestive functions, depends as much on dietetic as therapeutic measures. The physician should, therefore, be as familiar with dietetic as he is with medicinal formulæ, that he may use them as occasions arise.

The egg bears considerable resemblance to milk and to flesh, in its chemical composition, and it is often relished by infants and children. It is useful in states of feebleness, on account of its highly nutritive properties; and, if given nearly raw, it is easily digested. It should not be heated above 130° Fahr., for a higher temperature coagulates the albumen. It may be prepared by being placed in boiling water for two minutes. This will warm it sufficiently, while only a little of the exterior of the albumen is coagulated.

It remains to speak of meat and the meat-broths. Raw meat was first employed by Professor Weisse, of St. Petersburg, in the treatment of infantile diarrhœa, consequent on weaning. The lean of beef or mutton should be used, and the finely-divided portions removed by scraping, given to an infant from eight to twelve months old in quantity varying from one to two teaspoonfuls, three or four times in twenty-four hours. A larger amount may be given, if the infant wishes it. Raw meat prepared in this manner, or very finely cut, is not only very nutritious, but it sometimes agrees better with the digestive organs of the infant, than any of the preparations of milk.

The use of the pulp of raw meat was introduced into the Children's Wards of Philadelphia Hospital in 1855, by Dr. Caspar Lewis. It was seasoned with salt, and sometimes sugar was added, to render it more palatable. A teaspoonful was at first allowed three or four times daily, and the quantity was gradually increased. Infants who were suffering from mal-nutrition, were found to thrive with the use of this food as a part of their daily diet. The pulp of raw meat has been most frequently employed in private as well as hospital practice, in the treatment of the indigestion and diarrhœa of infants. Many infants reduced to a state of feebleness and emaciation gradually recover flesh and strength with the use of this diet, which is more easily digested, while it is more nutritious, than farinaceous substances or cow's milk. The only danger in the use of raw meat is that of producing trichinosis. With care, however, in selecting the meat, danger from this source is slight, as trichinosis is a comparatively rare disease. The late Professor Elliott, of Bellevue Hospital Medical College, never failed to recommend, in his lectures, the use of raw meat for infants wasted with chronic diseases, and whose digestive organs were enfeebled.

Beef-tea, prepared in the ordinary manner, by adding finely-divided meat to three or four times its bulk of cold water, allowing it to macerate half an hour, and then boiling it fifteen or twenty minutes, is much used for its highly nutritive properties in infantile diseases, as well as a food for healthy infants. Given, however, in diarrhœal affections of infants, I have often observed that it produced a laxative effect, so that it was necessary to discontinue its use. The same effect, though in less degree, sometimes occurs from the use of mutton or chicken-tea, in similar cases. Beef-essence prepared from finely-chopped beef, placed dry in a loosely-corked bottle, and standing three or four hours in boiling water, is a highly nutritive substance. It is the juice of the meat containing all those principles which heat can extract. It is often useful, given in small quantities, in exhausting diseases, especially in those in which the stomach is irritable, and more bulky food is rejected. Evidently, the albumen of the meat is coagulated by the heat, and, therefore, lost.

LIEBIG'S BEEF-TEA is too expensive for common use, but it is a more nutritious and better preparation than the beef-essence. It is prepared as follows: Finely-divided beef is lixiviated with cold water, so as to remove from it all soluble substances. The solution is evaporated to dryness over a sand bath, at a temperature of about 120°. At so low a temperature neither the albumen nor the coloring matter is coagulated. The tea, which contains, unchanged, nearly all the nutritive principles of beef, together with the salts, may be diluted with water at the time of its use.

Beef-tea which has been subjected to the action of gastric juice has also been recommended. The mucous membrane of the stomach of some animal is macerated in water, to which a little hydrochloric acid is added in the proportion of three drops of the strong acid to one ounce of water. The maceration, which should be at a temperature of about 70° Fahr., produces a liquid having the solvent properties of gastric juice. Beef-tea is prepared according to Liebig's formula, and then diluted with cold water. This solution should remain a few hours cold, and then the artificial gastric juice be added. The fibrin and albuminous substances are digested. The product which results has been called artificial chyme. In cases of deficient gastric juice, or feeble digestive power of the stomach, it is obvious that this food may possess decided advantages.

Dr. Routh speaks of Hogarth's Essence of Meat, which is little known in this country (*Infant Feeding*, page 303). "Of the composition," says he, "of this material I can say nothing, except that I believe it is a concentrated solution of meat tea—in fact, a meat tea reduced by the evaporation of its watery ingredients to the consistence of a syrup. I can, however, confidently speak from experience of its utility. It is certain that children who have been reduced to a state of great weakness by hand-feeding, or improper diet, occasionally recover, and that almost marvellously, under its influence. I have used principally the essence of beef. Its taste is much liked; and in doses of five or six teaspoonfuls daily, with a very little water, it is well digested by children. Indeed, it is often borne in infants affected with exhaustive diarrhœa from weaning, when milk and farinaceous food disagree."

Meat teas and essences, which require so much care and time in their preparation as those of Liebig and Hogarth, are obviously to be employed only in those cases in which there is disease or derangement of the digestive organs, or feebleness of the digestive function, so that the ordinary kinds of food disagree. Most infants in good health are able to digest at the age of twelve or fifteen months, when the period of weaning arrives, those kinds of solid food which are easily digested, if well prepared and mashed or cut fine.

As regards the use of farinaceous food for infants and young children, barley flour properly boiled in milk or water is as easily digested and as nutritious as rice, or wheat flour, or arrowroot, and in some instances it appears to agree better.

An article of food employed in this city for the diarrhœa of infants is prepared as follows: A pound of dry wheat flour, of the best quality, is packed snugly in a bag and boiled three or four hours. When it is taken from the bag, it is hard, resembling a piece of chalk, with the exception of the exterior, which is wet and should be removed. The flour grated from the mass should be used the same as arrowroot or rice.

B.

REMARKS ON THE PREVENTION OF SCARLET FEVER.

BY WM. BUDD, M.D.,

Honorary and Consulting Physician to the Bristol Royal Infirmary.

Much more, indeed, can be done to limit the spread of this malignant fever than the public are at all aware of, or than the common practice of medical men generally would seem to indicate.

There is good reason to believe that not only the eruption on the skin, but everything that is shed by the body of the infected, is heavily laden with the germs or seeds by which (alone, no doubt) the disease is propagated. The discharges from the throat and nose are, I imagine, especially virulent. It is more than suspected, on grounds on which I need not here insist, that those from the bowel are scarcely less so. As the kidney is known to be affected in a very special, and often in a very severe way, by the poison, this organ probably furnishes another outlet for it. All analogy tends to indicate, indeed, that in this case the renal epithelium, which is cast off so plentifully, performs the same eliminative function as that which is cast off in still greater profusion by the outer surface of the body. As the bulk of all these excreta soon finds its way to the cesspool or sewer, the large part which sewers and cesspools are known to play in the dissemination of the fever, and which, quite lately even, has been so strangely misinterpreted, is easily understood. I could enlarge much on this topic, if I had time to do so. It must suffice for the present to say, once for all, that all that has been shown to hold of typhoid fever in regard to these relations—contamination of drinking water included—may be applied, with little qualification, to scarlet fever also.

Taking these things as our data, the one thing to aim at, therefore, in seeking to prevent the spread of this fever, is to annihilate the germs proceeding from these various sources on their very issue from the body, and before the patient leaves the sick-room. In accordance with this view, I have long been in the habit, in all cases which fall under my own care, of enforcing the following simple precautions:—

1. The room in which the patient is detained is dismantled of all needless woollen or other draperies which might possibly serve to harbor the poison.

2. A basin, charged with chloride or carbonate of lime, or some other convenient disinfectant, is kept constantly on the bed, for the patient to spit into.

3. A large vessel, containing water impregnated with chlorides or with Condy's fluid, always stands in the room, for the reception of all bed and body linen, immediately on its removal from the person of the patient.

4. Pocket-handkerchiefs are proscribed; and small pieces of rag are used instead, for wiping the mouth and nose. Each piece, after being once used, is immediately burnt.

5. As the hands of nurses and of the medical attendant of necessity become frequently soiled by the specific excreta, a good supply of towels, and two basins, one containing water with Condy's fluid or chlorides, and another plain soap and water, are always at hand, for the immediate removal of the taint.

6. All glasses, cups, or other vessels, used by or about the patient, are scrupulously cleaned before being used by others.

7. The discharges from the bowel and kidney are received, *on their very issue from the body*, into vessels charged with disinfectants.

By these measures, the greater part of the germs which are thrown off by internal surfaces are robbed of their power to propagate the fever. Those which are thrown off by the skin require somewhat different management. If my information do not mislead me, it is in dealing with these that the practice of medical men generally is most defective. There are, no doubt, distinguished exceptions; but for the most part, either nothing is done, or what is done is done imperfectly or too late. And yet to destroy from the first, as far as possible, the infectious power of what emanates from the skin, is, for obvious reasons, the most important object of all in the way of prevention.

In the first place, as the skin is at once the most extensive surface of the body, and is, *par excellence*, the seat of what, by a very just figure, is called the *eruption*, the crop of new poison which escapes by the skin probably far exceeds in amount that which escapes by the other surfaces. It is impossible to speak in exact figures here. We cannot count these things as we count peas, or beans, or grains of wheat. But the care of smallpox furnishes us with a standard which cannot far mislead us. And, as we know that, in a case of confluent smallpox, enough new poison is thrown off actually to inoculate with smallpox myriads of others, so there is every reason to believe that the skin-crop in a severe case of scarlet fever is little, if at all, less prolific.

In the next place, as the process of desquamation, by which this crop is finally cast loose, is a very slow one—lasting, for the most part, over many weeks—the infection from this source is much more abiding than that from the internal sources. But what renders it still more so is the all-important fact that the poison which is liberated by the skin is liberated in the dried state. It is well known—and, indeed, the circumstance has been taken advantage of in the practice of inoculation by cowpox and other poisons—that animal poisons, when dried at a gentle heat, retain their powers for quite indefinite periods of time. But to be dried at a gentle heat—a heat lower in fact than that which attended its own generation—is precisely the case of the scarlet fever poison, as cast off by the skin.

Another danger is created by the minute and impalpable form in which the particles armed with the poison are set free. The skin peels off in part, no doubt, in flakes of palpable size, but in still greater part, under the guise of dust, which floats in the air, impalpable like motes in the sunbeam. Each of these little atoms is, potentially, the scarlet fever. While they adhere to the body, they may be readily disarmed; but once afloat, they are in great degree beyond our power.

It is to these various circumstances—to the countless profusion of the new seed, if I may so speak, which is generated and sown broadcast by every fresh case—to the length of time during which it hangs about the sick, capable every moment of being transferred, with all its deadly power, to thing or person—to the impalpable minuteness of the organic particles in which this seed is imbedded—and, lastly, to the long retention of their properties, in virtue of being in the dried state—that we must look mainly for the true explanation of the well-known subtleness and tenacity of this particular infection. To the many striking illustrations of this subtlety and tenacity on record, I could, if there were need, add many of my own, quite as striking, and free from all ambiguity; but it is a waste of time and space to burden the page with what is already conceded, and with what most men must be sufficiently familiar.

These same circumstances are the source of the peculiar embarrassment and perplexity, which, in scarlet fever, hang over the disposal of the convalescent, and the period, so much debated, and at present confessedly undetermined, at which he may be safely restored to society.

According to my own experience, these difficulties and perplexities may be entirely averted by the employment of the simplest precautions. To be successful, these precautions must be put in force early, and must be thoroughly carried out. The first thing to aim at, is, to prevent the minute particles, which are the carriers of the poison, from taking wing, until they can be disenfected *in situ*. This, I find, can be perfectly effected by simply anointing the surface of the body, scalp included, twice a day with olive oil. The oil I use is, generally, slightly impregnated with camphor. As far as the main object is concerned, the addition is perhaps unimportant; but it is agreeable to the patient, and probably has some part in the relief, which almost always follows the inunction, from the troublesome itching, which is a well-known incident of some stages of the disorder. Current views would, perhaps, indicate carbolic acid as a fitter adjunct; but, having found the camphorated oil to answer perfectly, I have thought it the part of wisdom to make no change. I may add, that the process, so far from being trying, is very soothing to the sick; and, if it exert any influence at all on the evolution of the disorder, this influence appears to be beneficial rather than otherwise. The precise period at which it should be begun varies somewhat, no doubt, in different cases. As early as the fourth day of the eruption, a white efflorescence may often be observed on the skin of the neck and arms, which marks the first liberation of the new death-giving brood. This efflorescence should be made the signal for the first employment of the oil. From this time, the oiling is continued until the patient is well enough to take a warm bath, in which the whole person—scalp again included—is well scrubbed, disinfecting soap being abundantly used during the process. These baths are repeated every other day, until four have been taken, when, as far as the skin is concerned, the disinfection may be regarded as complete. If the health be quite recovered—if, in particular, there be no disease of kidney and no discharge from throat or nostril—the patient (equipped, of course, in a new or perfectly untainted suit) may generally be restored without risk to his family. A week or ten days' additional quarantine is, however, seldom objected to; and is, on the whole, perhaps more prudent. Many medical men are in the habit of fumigating the sick-room, either constantly or several times a day, with chlorine or sulphurous acid, pending the whole course of the fever. There can be no objection to this measure; but I do not myself attach much importance to it. Experience of the largest and most decisive kind has shown that chlorine—and I believe the observation applies equally to the other chemical agent—in the degree of atmospheric impregnation respirable by man, has no appreciable influence in preventing the spread of infectious disorders. To complete the preventive code, immediately after the illness is over—whether ending in death or recovery—the dresses worn by the nurses (which, where possible, should be of linen, or some smooth thing) are washed or destroyed, and the bed and room that have been occupied by the sick are thoroughly disinfected. With these measures, when well and thoroughly done, the taint is finally extinguished. The success of this method, in my own hands, has been very remarkable. For a period of nearly twenty years, during which I have employed it in a very wide field, I have never known the disease to spread in a single instance beyond the sick-room, and in very few instances within it. Time after time I have treated this fever in houses crowded from attic to basement, with children and others, who have nevertheless escaped infection. The two elements in the method are, separation on the one hand, and disinfection on the other. (*British Medical Journal*, Jan. 9th, 1869.)

The Health Board of New York enforce the following Sanitary Regulations against Scarlatina and Measles:—

Every case must be reported to the City Sanitary Inspector upon its first recognized appearance.

Care of Patients.—The patient should be placed in a separate room, and no person except the physician, nurse, or mother, allowed to enter the room, or to touch the bedding or clothing used in the sick-room, until they have been thoroughly disinfected.

Infected Articles.—All clothing, bedding, or other articles not absolutely necessary for the use of the patient, should be removed from the sick-room. Articles used about the patient, such as sheets, pillow cases, blankets, or clothes, must not be removed from the sick-room until they have been disinfected, by placing them in a tub with the following disinfecting fluid: eight ounces of sulphate of zinc, one ounce of carbolic acid, three gallons of water.

They should be soaked in this fluid for at least one hour, and then placed in boiling water for washing.

A piece of muslin, one foot square, should be dipped in the same solution and suspended in the sick-room constantly, and the same should be done in the hallway adjoining the sick-room.

Feather beds and pillows, hair pillows and mattresses, and flannels or woollen goods, require fumigation, and should not be removed from the sick-room until after this has been done. Whenever the patient is removed from the sick-room, notify the Bureau of Sanitary Inspection, when the disinfecting corps will as soon as possible thereafter perform the work of fumigation.

All vessels used for receiving the discharges of patients should have some of the same disinfecting fluid constantly therein, and immediately after use by the patient be emptied and cleansed with boiling water. Water closets and privies should also be disinfected daily with the same fluid, or a solution of chloride of iron, one pound to a gallon of water, adding one or two ounces of carbolic acid.

All straw beds should be burned, but must not be removed from the sick-room without a permit from this department. They will be removed by the disinfecting corps.

It is advised not to use handkerchiefs about the patient, but rather soft rags for cleansing the nostrils and mouth, which should be immediately thereafter burned.

The ceilings and side walls of the sick-room after removal of the patient should be thoroughly cleaned and lime washed, and the woodwork and floor thorougly scrubbed with soap and water.

C.

REMARKS ON THE DIPHTHERITIC MEMBRANE.

By Dr. Edward Rindfleisch,
Professor of Pathological Anatomy in Bonn.

Genuine diphtheritis has no claim to be regarded as a specific process in the same measure as croup. That which microscopically characterizes it, and has become the occasion of placing it as a membranous inflammation by the side of the pseudo-membranous inflammation, is the formation of a whitish-gray, often discolored by reddish and green (blood-coloring matter) tints, compact, felted membrane, which is elevated, perhaps, to the height of one-half line alone the level of the mucous membrane, but penetrates just as deep into the substance of the mucous membrane, and is most intimately connected with the latter. This membrane is nothing that is superimposed, nothing secreted, but the mucosa itself, as far as it has been partly tumefied, partly rendered anæmic, even by the excessive infiltration with cells. This condition has not improperly been compared with a mortification by a chemical agent, with a corrosion, and the diphtheritic membrane has been designated as diphtheritic scab; in fact the diphtheritic membrane is a caput mortuum, it can undergo no other changes than those of putrefaction, of decomposition; and the question only is, how it is loosened and removed from the intimate organic connection in which it stands with the mucous membrane. A sharply defined boundary line separates, as we can convince ourselves with the naked eye, the living from the dead; but numerous connective-tissue fibres, bloodvessels, nerves, and elastic fibres, pass over from the living into the dead; they must all have separated ere the loosening can proceed. The means which are placed at the command of the organism are inflammation and suppuration. We call this inflammation "reactive," and unite with it the idea as though this were an answer to the irritation, which the diphtheritic scab exerts upon the surrounding mucous membrane; yet a portion of the hyperæmia also may be explained according to static principles as collateral fluxion. The pus collects between the scab and the healthy parts and always, accordingly as the fibrous bridges mentioned melt down and tear, the separation begins now at the edges, then at the centre. After it is completed an ulcer remains behind which is disposed to rapid cicatrization; not unfrequently, however, the process repeats itself again at the same place; we have a new scab, and with it anew the necessity of a purulent separation, after whose termination a very considerable loss of substance remains. The cicatrices finally resulting distinguish themselves by their capacity of vigorous retraction, so that the danger of subsequent contraction of mucous membrane canals, especially of the large intestine after dysentery, threatens so much the more, the more diffused the ulceration was. (*Text-book of Pathological Histology*, translated, page 354.)

E.

The following observations relate to the state of the liver in that form of infantile entero-colitis which prevails in the summer months, especially in the cities. They were made in order to determine the correctness or falsity of a pretty general belief on the part of city practitioners, arising probably from the frequent green appearance of the stools, that the function of the liver is perverted, and the bile therefore unhealthy, in this disease. These observations are sufficiently numerous, in my opinion, to prove that mercurial or other treatment

designed to modify or correct the function of this organ is not justified by the anatomical characters of the disease.

June 8, 1859. Aged 5 months; duration of sickness, 6 days. Liver appeared healthy; about the usual size.

June 8, 1859. Aged 3 months; duration of sickness, 20 days. Liver of usual size and color; it contained the usual amount of oil globules; from one to six or eight globules in each hepatic cell.

June 10, 1859. Aged 4 months; duration of sickness, 5 days. Liver of ordinary appearance; contains rather less fatty matter than usual; few hepatic cells contained more than five or six oil globules.

July 4, 1859. Aged 7 months; duration of sickness, 3 weeks. Liver of yellower hue than natural; not enlarged; the oil globules considerably exceeded the usual amount.

July 16, 1859. Aged 9 weeks; duration of sickness, 3 weeks. Liver small and almost destitute of oil globules; nine-tenths of the hepatic cells contained none.

August 8, 1859. Aged 7 months; duration of sickness, 1 month. Liver appeared healthy; weighing oz. iv.

August 15, 1859. Aged 19 months; duration of sickness, several weeks. Liver extended half an inch below the margin of the ribs; weighed oz. ix; but few oil globules in most of the hepatic cells; a few contained numerous small globules.

August 15, 1859. Aged 15 months; duration of sickness, 2 months. Liver of usual appearance; weight, oz. vijss; nothing unusual observed in this organ under the microscope.

August 15, 1859. Aged 14 months; duration of sickness, 3 weeks. Liver weighed oz. ix; its appearance natural both to the naked eye, and under the microscope.

August 17, 1859. Aged 15 months; duration of sickness, several weeks. Liver appeared healthy; weight, oz. vj.

August 22, 1859. Liver of normal appearance; it contained the usual amount of oil globules; weight, oz. viij.

August 27, 1859. Aged 9 months. Liver of natural color generally, but yellow in places; weight, oz. viij; no more than the usual amount of fatty matter discovered by the microscope.

August 31, 1859. Aged 5 months; duration of sickness, at least one month. Surface of liver mottled of a yellow color; no excess of oil globules generally; weight of liver, oz. vjss.

September 4, 1859. Aged 2 months; duration of sickness, one week. Liver of normal appearance; few hepatic cells contained more than four oil globules and many contained none; little free oily matter.

September 5, 1859. Age 16 months. Liver small; weighing oz. vj, and containing very little oily matter.

September 15, 1859. Aged 23 months; duration of sickness, all summer. Liver quite fatty; weighing oz. xv; had tuberculosis.

July 3, 1860. Aged 13 months; duration of sickness, nearly one month. Liver of yellow color; weight, oz. vj; hepatic cells contained somewhat more than the usual oily matter.

July 3, 1860. Aged 4 weeks. Liver extended two inches below the ribs; weight, oz. v; contained few oil globules.

August 4, 1860. Duration of sickness, 2 weeks. Liver weighed oz. ix; mottled yellow; very fatty.

August 7, 1860. Aged 2 months; duration of sickness, 10 days. Anterior border of liver even with the margin of the ribs; weight, oz. iijss; usual color; very few oil globules, free or in the hepatic cells.

August 8, 1860. Aged 2 years. Liver mottled with yellow, evidently fatty spots or patches.

August 17, 1860. Liver extended half an inch below the lower margin of the ribs; of usual color; weight, oz. v.

August 30, 1860. Aged 5 months; duration of sickness, 1 week. Liver extended half an inch below the margin of the ribs; rather yellow; weight, oz. ix; numerous oil globules, both free and in the hepatic cells.

July 18, 1861. Liver about the usual size and appearance, except that the color is lighter in some places than in others.

August 1, 1861. Aged 2 months; duration of sickness, about 1 week. Liver small and very dark; the microscope showed it to be almost destitute of oily matter.

August 12, 1861. Aged 3½ months. Anterior margin of liver even with the ribs; weight, oz. vss.

August 19, 1861. Aged 15 months. Weight of liver, oz. ixss; contained the normal amount of fat.

August 21, 1861. Aged a few months. Liver of usual appearance; weight oz. iijss.

October 9, 1861. Aged 20 months; duration of sickness, all summer. Liver rather yellow, but not uniformly; weight, oz. ix; some hepatic cells free from fat; others loaded with it.

July 7, 1862. Aged 4 months; duration of sickness, several weeks. Weight of liver, oz. v; yellow, very fatty.

August 27, 1862. Aged 7 months; duration of sickness, several weeks. Liver examined by the microscope seemed healthy; weight, oz. vi¼.

August 29, 1862. Aged 10 months; duration of sickness, 1 week. Weight of liver, oz. vi¾; appeared healthy, except an increase in the amount of oil globules.

F.

INTUSSUSCEPTION IN SMALL INTESTINE.

No. 1. Aged 12 years. Had pain in abdomen two or three weeks previously. Died the fifth day. Twelve inches of the upper part of the jejunum invaginated in the next twelve inches below. (M. R. Trevor, Amer. Journ. Med. Sci., Jan. 1852.)

No. 2. Aged 3 years. Previous health not stated. Died the second day. At about the junction of the jejunum and ileum, twenty-six inches of intestine had been received into six inches. (Isaac Thomas, M.D., Amer. Med. Recorder, 1823.)

No. 3. Aged 4½ months. Previous health good. Died the fourteenth day. Locality of disease, upper part of ileum; the mass was two-thirds of an inch long. (Dr. J. L. Smith, Amer. Med. Times, July 18, 1863.)

No. 4. Aged 4 months. Had entero-colitis previously to and during the intussusception. Four invaginations in the jejunum, each from one to one and a half inches in extent. (Records of N. Y. Infant Asylum, July 18, 1863.)

INTUSSUSCEPTION OF ILEUM INTO COLON.

No. 5. Age not stated. Had previously constipation, followed by diarrhœa and convulsions. Died on the fifth day. Two inches of the ileum projected into the cœcum. (Dr. Mayne, Path. Soc. Dublin, March 16, 1839.)

No. 6. Aged 2 years. Previously well. Died the second day. About three inches of the ileum inverted had passed through the ileo-cœcal valve into the colon. (Dr. Coggswell, Lond. Lanc., July, 1853.)

No. 7. Aged 4 years. Previously well, except slight diarrhœa. Died the tenth day. Thirteen inches of the ileum had passed through the ileo-cœcal valve into the cœcum. (Mr. Filleter, Lond. Lanc., May, 1855.)

No. 8. Aged 3 years. Previous health not given. Died after seven days. At least a foot of the ileum had passed through the ileo-cœcal valve. (Mr. Nunnelly, Path. Soc. London, March 20, 1860.)

No. 9. Aged 4 months. Previous health good. Died after six weeks. The ileum, still adherent, had passed through the entire colon, so as to protrude six inches beyond the anus. (S. Jones, Lond. Path. Soc., 1857.)

No. 10. Aged 6 months. Previously well. Died the third day. The ileum had passed through the cœcum and into the ascending colon. (Dr. Cotting, Bost. Soc. for Med. Improvement, July, 1852.)

No. 11. Aged 4 years and 9 months. Had a cough, and since the age of eighteen months, thread worms; was annoyed by these the day before the sickness. Died the fifth day. Seven inches of the ileum had passed through the ileo-cœcal valve. (Dr. Hare, Lond. Path. Soc.,

INVAGINATION OF THE CŒCUM, ILEUM AND CŒCUM, OR ILEUM, CŒCUM, AND COLON.

No. 12. Aged 5 months. Previous health good. Died the fifth day. Six inches of the ileum and the ascending colon were invaginated in the sigmoid flexure and rectum. (Thomas Blizard, Med-Chir. Trans., vol. i.)

No. 13. Aged 4 months. Previous health good. Lived more than one week. A small portion of the ileum and the entire colon to the sigmoid flexure, were imbedded in the latter. (Alfred Markwick, Lond. Lanc., 1846.)

No. 14. Aged 1 year. Diarrhœa previously. Died on the seventh day. A portion of the ileum with the cœcum invaginated in the ascending and transverse colon. (Dr. O'Ferrall, Lond. Med. Times, January 16, 1847.)

No. 15. Aged 6 months. Previous health good. Died the third day. Several inches of the ileum, the cœcum, the ascending and the transverse colon, were lodged in the remainder of the transverse and in the descending colon. (Chas. Clarke, Lond. Lanc., August 18, 1849.)

No. 16. Aged 4 months. Previous health good. Died the third day. Lower part of the ileum, the cœcum, ascending colon, and greater part of the transverse were imbedded in the descending portion. (E. Y. Steele, Lond. Lanc., June 23, 1849.)

No. 17. Aged 4 months. Sick two days previously. Died the third day. Cœcum and ascending colon invaginated in the transverse and descending colon. (P. P. Nind, Lond. Lanc., June 23, 1849.)

No. 18. Aged 20 months. Previous health not stated. Died on the fourth day. Six or seven inches of the lower portion of the ileum, the cœcum, and the ascending colon were filled with inverted intestine; the six or seven inches of the ileum were drawn together so as to measure only one inch, and this part of the ileum had formed a second invagination in the cœcum to the extent of two inches. (Mr. Taylor, Lond. Lanc., 1843.)

No. 19. Aged 4 years. Previous health not stated. Lived three days. Lower part of the ileum and the entire colon were invaginated in the rectum. (W. S. Partridge, Prov. Med. and Surg. Journ., May 3, 1848.)

No. 20. Aged 5 months. Previous health not stated. About one inch of the ileum and the entire colon to the left hypochondrium were lodged in the remaining portion of the colon and in the rectum. (R. Harlan, M.D., F.R.S., Med. and Phys. Researches.)

No. 21. Aged 6 years. Diarrhœa and pain in abdomen. The caput coli and the first half of the colon had descended through the other half and the rectum; the lower part of the ileum was drawn down through the centre of the intussusception to the anus. (Mr. Davis, Med. Repos., December, 1824.)

No. 22. Aged 9 months. Had occasional diarrhœa. Died the third day. A considerable portion of the ileum and the caput coli had been forced up the ascending colon, across the transverse and down to the rectum. (H. Cunningham, Lond. Med. Gaz., September 15, 1838.)

No. 23. Aged 4 months. Previous health not given. Died the fourth day. Lower portion of the ileum, the ascending colon, and a part of the transverse colon were invaginated in the remaining portion of the colon and the rectum. (Alex. Munro, Path. Anat. of the Aliment. Canal.)

No. 24. Aged 4 months. Previous health good. Died the third day. Cœcum and ascending colon were lodged in the transverse and beginning of the descending portions: in the interior of the mass was a second invagination, that of the ileum. (Dr. Ryan, Med. Soc. of Lond., October 27, 1835.)

No. 25. Aged 4 months. Previous health good. Died the second day. Part of the ileum and cœcum and a considerable portion of the colon were invaginated. (Evory Kennedy, Dub. Journ. of Med. Sci., March 1, 1844.)

No. 26. Aged 7 months. Previous health good. Died the third day. Part of the ileum and the cœcum had descended through the colon and rectum to within half an inch of the anus. (Dr. Buchanan, Lond. Path. Soc., May 3, 1859.)

No. 27. Aged 6 months. Previous health good. Died the fifth day. A part of the ileum and the whole upper portion of the large intestines were inclosed in the descending colon and the rectum, to within two inches of the anus. (Mr. Ballard, Lond. Path. Soc., January 6, 1857.)

No. 28. Aged 3 months. Previous health good. Died the third day. Part of the ileum and the ascending and transverse colon were lodged in the descending colon. (J. W. Perrin, Lancet, March 26, 1853.)

No. 29. Aged 3 months. Previous health not stated. Died the first day. A large part of the ileum, the ascending and transverse colon were invaginated in the descending portion. (M. Judson, Gaz. Méd., Decembre, 1837.)

No. 30. Aged 3½ years. Almost constant pain in the bowels for three months before death. The cœcum and entire colon, to within eleven inches of the anus, were invaginated in the remainder of the colon and in the rectum. The inclosed intestine protruded five or six inches beyond the anus. (M. Robin, Mém. de l'Acad. Roy. de Chirurg., 1784.)

No. 31. Aged 4 years. Had dysentery previously. Died after sickness of nearly a month. The ascending and transverse colon were found in the sigmoid flexure and rectum; the ileum extended uninverted through the whole mass. (John C. Lettsom, M.D., F.R.S.)

No. 32. Aged 9 months. Previous health delicate, but without disease. Died the second day. Six inches of the ileum, the ascending and transverse colon lay within the descending colon and the rectum. (Mr. Young, Brit. Med. Journ., September 24, 1859.)

No. 33. Aged 11½ months. Previous health not stated. Died the third day. About four inches of the ileum, the ascending and transverse colon, were invaginated in the descending colon. (Mr. Clarke, Lond. Lanc., February 17, 1838.)

No. 34. Aged 6 months. Previous health not stated. Died the eighth day. The cœcum, ascending and transverse portions of the colon were invaginated in the descending colon. (E. Smith, Lond. Path. Soc., December 4, 1848.

No. 35. Aged 4 months. Previous health good. Died in nineteen hours. Lower portion of the ileum incarcerated in the ascending colon, which was also invaginated in the arch. (Mr. Gorham, Guy's Hosp. Reports, October, 1838.)

No. 36. Aged 3 months and 4 days. Previous health good. Died on the eighth day. Twelve inches of the ileum doubled on itself had descended the whole length of the colon, so as to protrude from the anus; colon drawn together, the mass occupying less than a foot. (Dr. J. L. Smith, N. Y. Path. Soc., June, 1861.)

No. 37. Aged 3 years and 4 months. During two years before death complained of pain in abdomen. The cœcum was inverted, and had descended to the lower portion of the rectum. (Wilmer Worthington, M.D., Amer. Journ. of Med. Sci., January, 1849.)

No. 38. Aged 10 months. Previous health good, except liability to constipation. Lived two days. A double intussusception; the inferior portion of the ascending colon was invaginated in the superior, and the whole again invaginated in the transverse colon. (Dr. Blake, Prov. Med. and Surg. Journ., May 3, 1848.)

No. 39. Aged 11 years. Previous health not stated. Recovered. On the sixth day, the caput coli and a portion of the colon, with the meso-colon, measuring thirteen and three-fourths inches, were passed from the bowels. (J. W. Bowman, Edin. Med. and Surg. Journ., October, 1813.)

No. 40. Aged 6 years. Previous health not stated. Recovered. On the eleventh day voided the cœcum and a part of the colon. (Chas. King, Lond. Lanc., 1854.)

No. 41. Aged 4 months. Previous health good. Died the third day. The cœcum had descended through the colon, nearly to the rectum. (Dr. Penquier, L'Union Médicale, Aug. 22, 1861.)

No. 42. Aged 5 years. Was ill with fever and pain in region of bladder for four months; date of commencement of intussusception not known. Recovered. Passed by stool eight inches of the ileum, the cœcum, and four inches of the colon. (Dr. Quain, Lond. Path. Soc., Aug. 16, 1859.)

No. 43 Age not stated. Previous health good. Died the third day. The upper part of the descending colon had descended into the inferior part to the extent of two inches. (Dr. Montgomery, Lond. Med. Times, December 23, 1848.)

No. 44. Aged 6 months. Slight diarrhœa two or three days previously to sickness. Intussusception in the transverse colon to the extent of two or three inches. (E. Y. Steele, Lond. Lanc., June 23, 1849.)

No. 45. Aged 4 months. Had nausea with vomiting for three weeks previously to severe symptoms. Died after six days. The lower portion of the colon, and the upper part of the rectum, had descended into the portion below. (Mr. Howship, Edin. Med. Journ., April, 1812.)

UNCERTAIN.

No. 46. Aged 4 months. Had disordered bowels from birth. Died on the sixth day. An intussusception was found in the left iliac region. (H. F. Carter, Lond. Lanc., June 2, 1849.)

No. 47. Aged 6 years. Previous health not stated. Recovered. Twenty-three inches of intestine were discharged. (Levi Gaylord, Amer. Journ. of Med. Sci., October, 1827.)

No. 48. Aged 12 years. Previous health not stated. Recovered. Fifteen or eighteen inches of ileum were passed by stool. (F. Bush, Lond. Med. and Phys. Journ., December 18, 1823.)

No. 49. Aged 12 years. Had occasional purging and pain in the bowels. Recovered. A portion of ileum twelve inches long was passed. (John Lang, Lond. Lanc., October, 1855.)

No. 50. Fatal. An invagination of the intestine was found in the rectum. (Dr. Jacobi, N. Y. Path. Soc., August 8, 1861.)

No. 51. Aged 9 years. Had dysentery previously. Recovered. A portion of intestine measuring ten inches was passed. (Dr. Patterson, Medico-Chirurg. Soc., Edin.)

No. 52. Aged 8 months. Previous health good. Died the second day. A portion of intestine protruded. (E. Y. Steele, Lond. Lanc., June 23, 1849.)

INDEX.

ABDOMINAL viscera, tubercles in, 123
  Abscess, peri-pharyngeal, 559
Abscess in lungs, 480
Acarus scabiei, 711
Accidents, incidental to birth, 62
Acephalus, 298
  anatomical characters, 298
  symptoms, 299
  prognosis, 299
Acid, hydrocyanic, in pertussis, 257
Acne, syphilitic, 153
Affusions, cold, in scarlet fever, 189
Allin, Dr., statistics of peri-pharyngeal abscess, 559
Animal heat, 85
Apnœa of the new-born, 62
  causes, 62
  treatment, 63
Appendix A., dietetic formulæ, 715
Appendix B., Wm. Budd on prevention of scarlet fever, 720
Appendix C., Prof. Rindfleisch, remarks on the diphtheritic membrane, 725
Appendix E., statistics of state of liver in entero-colitis, 726
Appendix F., statistics of intussusception, 728
Aqueous cancer of infants, 544
Armor, Dr., case of tænia, 637
Arteritis, umbilical, 69
Artificial feeding, 57
Ascaris vermicularis, 636
  lumbricoides, 634
Asphyxia of the new-born, 62
Atrophy of brain, 301
Attitude in disease, 79

BARKER, Prof. Fordyce, on turpeth mineral in croup, 467
Baths, 60
Billard, case of tetanus infantum, 383
  cases of gangrene of mouth, 540
Bouchut's views of scrofula, 116
  on santonin as an anthelmintic, 643
Bowditch, Dr., mode of performing thoracentesis, 522
Brain, its chemical analysis, 297
  its growth, 297
  absence of, 298
  imperfect, 299
  atrophy, 301
  hypertrophy, 304
  congestion, 314
Bretonneau, on diphtheria, 238
Brodie, Sir Benjamin, on chorea, 424
Bromides in pertussis, 254
Bronchitis in measles, 163
Bronchial phthisis, 132
  physical signs, 140
Bronchitis, 476
  causes, 477
  anatomical characters, 477
    capillary, 478
    complications, 480
      pneumonia, 480
      abscesses, 480
    dilation of bronchial tubes, 481
  symptoms, 481
    in capillary bronchitis, 483
    chronic, 484
  diagnosis, 485
  prognosis, 485
  treatment, 486
Brown-Séquard, on compression of sympathetic nerve for eclampsia, 379
Bruit de soufflet of anterior fontanelle, 101
Büchler, Dr., cases of intussusception, 670
Bulbous fingers, 78
Bumstead on syphilis, 151

CALOMEL, its use in croup, 467
  Cancrum oris, 538
Caput succedaneum, 64
Care of mother in pregnancy, 20
Carswell, Dr., on softening of stomach, 582
Castor-oil plant as a galactogogue, 47
Catamenia, its effect on the milk, 40
Cavities in lungs, 131
Cellulitis, scrofulous, 111

- Cephalæmatoma, 64
- Cerebro-spinal system, diseases, 295
- Chenopodium, 644
- Chickenpox, 224
- Childhood, 19
- Cholera infantum, 624
  - causes, 625
  - symptoms, 625
  - anatomical characters, 627
  - diagnosis, 630
  - prognosis, 630
  - treatment, 630
- Chorea major, 421
- Chorea (chorea minor), 415
  - age, 416
  - causes, 416
    - sex, 417
    - uterine irrritation, 417
    - anæmia, 417
    - rheumatism, 418
    - embolism, 420
    - fright, 420
    - irritation, 421
    - intestinal irritation, 421
    - lesions of brain and spinal cord, 422
  - anatomical characters, 423
  - symptoms, 424
  - prognosis, 426
  - cause, 426
  - treatment, 427
    - regimenal, 427
    - medicinal, 428
- Church, Dr. A. S., case of tonic convulsions from dentition, 550
- Cimicifuga in treatment of chorea, 429
- Circulatory system, 82
- Cirrhosis, syphilitic, 154
- Clark, Prof. A., case of syphilis from vaccination, 219
- Clarke, Dr. Joseph, on treatment of tetanus infantum, 387
- Clothing, 60
- Coates, Dr., treatment of gangrene of mouth, 545
- Colitis in childhood, 620
  - causes, 620
  - symptoms, 621
  - diagnosis, 622
  - prognosis, 622
  - treatment, 622
- Colles, Dr., on tetanus infantum, 388
- Colostrum, 34
- Condie, Dr. D. F., on erysipelas, 289
  - on turpentine as an anthelmintic, 645
  - erysipelas, 289
- Congestion of brain, 314
  - causes, 314
  - symptoms, 317
  - anatomical characters, 317
  - prognosis, 317
  - treatment, 318
- Congestion of stomach, 574
- Conjunctivitis of the new-born, 65
  - causes, 66
- Conjunctivitis—
  - symptoms, 66
  - treatment, 67
- Convulsions, 369
  - internal, 405
- Coryza, acute and chronic, 445
    - anatomical characters, 446
    - symptoms, 446
    - prognosis, 447
    - treatment, 447
  - syphilitic, 152
- Cranial sinuses, thrombosis of, 308
- Craniotabes, 96
- Croup, false or spasmodic, 452
  - true, or pseudo-membranous, 458
- Cruveilhier, M., on gelatinous softening, 581
- Cummings, Dr. W. H., on amount of milk secreted, 41
- Curvatures in rachitis, 97
- Cyanosis, 674
  - literature of, 675
  - sex, 678
  - causes of malformations, 678
  - time of commencement, 680
  - symptoms, 681
  - prognosis, 686
  - mode of death, 687
  - modes of compensation, 689
  - morbid anatomy, 689
  - theories relating to its etiology 691
  - treatment, 693

- DALTON, Prof., effect of maternal emotions, 23
  - on iodide of starch, 119
- Dartrous diathesis, 707
- Dentition, 546
    - physiological, 547
    - pathological results of, 548
      - gengivitis, 548
      - stomatitis, 548
      - diarrhœa, 549
      - convulsions, 549
        - tonic, 550
          - case, 550
        - paralysis, 550
    - diagnosis, 551
    - treatment, 551
  - second, 554
  - in rachitis, 99
- Diagnosis of infantile diseases, 000
- Diarrhœa, 585
  - choleriform 624
  - non-inflammatory, 585
    - causes, 586
    - symptoms, 587
    - anatomical characters, 588
    - diagnosis, 589
    - prognosis, 589
    - treatment, 590
- Diday, on syphilis, 157
- Diet, improper, a cause of infantile mortality, 27

- Digestion, post-mortem, 580
- Digestive system, 86
- Diphtheria, 228
  - forms, 228
  - anatomical characters, 228
  - appearance of pseudo-membrane, 229
  - confervoid growth on it, 230
  - adenitis, cervical, in, 232
  - symptoms, 232
  - albuminuria in, 235
  - nature, 237
  - contagiousness, 238
  - incubative period, 239
  - sequelæ, 239
  - paralysis, 240
  - prognosis, 241
  - diagnosis, 242
  - treatment, 243
- Diseases of umbilicus, 69
- Donné, Dr., on ascertaining the capability for wet-nursing, 29
  - discovery of pus in the milk by the microscope, 33
- Dysentery, in childhood, 620
- Dyspepsia, 567

- ECLAMPSIA, 369
  - causes, 370
  - premonitory stage, 371
  - symptoms, 372
  - anatomical characters, 375
  - diagnosis, 376
  - prognosis, 377
  - treatment, 378
- Ecthyma, 153
- Eczema, 704
  - varieties, 704
  - diagnosis, 706
  - treatment, 707
    - general, 708
    - local, 709
- Electricity as a galactogogue, 45
- Elliott, Prof. Geo. T., cases of peri-pharyngeal abscess, 560, 565
  - use of raw meat, 719
- Emotions, effect in pregnancy, 20
- Emphysema in tuberculosis, 131
- Enteritis in childhood, 620
  - causes, 620
  - symptoms, 621
  - diagnosis, 622
  - prognosis, 622
  - treatment, 622
- Entero-colitis 592
- Erysipelas from vaccination, 218
- Erysipelas, 284
  - cases, 285
  - age, 286
  - point of commencement, 286
  - causes, 286
  - from vaccination, 287
  - during epidemics of puerperal fever, 288
  - symptoms, premonitory, 289
- Erysipelas—
  - symptoms, 290
  - prognosis, 291
  - duration, 291
  - modes of death, 292
  - pathological anatomy, 292
  - treatment, 293
- Erythema, 695
  - forms and causes, 695
  - prognosis, 697
  - diagnosis, 697
  - treatment, 697
- Ether, in spasmodic laryngitis, 456
- Evanson and Maunsell, on treatment of gangrene of mouth, 545

- FACIAL paralysis, 440
- Falkland's, Prof., preparation of milk for infants, 715
- Features in disease, 76
- Feeding, a cause of infantile mortality, 26
  - artificial, 57
- Fever and ague, 263
- Fleming, Mr., on retro-pharyngeal abscess, 560
- Flint, Prof. Austin, Jr., on the diet of children, 27
- Flint, Prof. Austin, Sen., prevention of pitting in smallpox, 211
  - on thoracentesis, 521
- Fœtus, effect on it of maternal emotions, 21
- Fox, Tilbury, on seat of strophulus, 703
- Friedleben, Dr., on state of thyroid gland in internal convulsions, 406
- Fungus of umbilicus, 71

- GALACTOGOGUES, 45
  - electricity, 45
  - ricinus communis, 47
- Galactorrhœa, causes, 48
  - treatment, 49
- Gangrene in scarlatina, 177
  - of the mouth, 538
    - anatomical characters, 538
    - age, 539
    - causes, 540
    - symptoms, 540
    - diagnosis, 542
    - prognosis, 542
    - treatment, 544
- Gastric tuberculosis, 133
- Gastritis, 574
    - causes, 575
    - age, 576
      - case, 576
    - symptoms, 577
    - anatomical characters, 577
    - diagnosis, 578
    - prognosis, 578
    - treatment, 578
  - diphtheritic, 579

- Gastritis—
  - follicular, 579
- Gastro-intestinal hemorrhage, 646
- Gelatinous softening, 580
- Gilfillan, Dr., on use of ricinus communis as a galactogogue, 48
- Glottis, spasm of, 405
- Granulations, umbilical, 71
- Grease in the horse, its identity with vaccinia, 214
- Guersant, M., on prognosis in meningitis, 359
  - on thoracentesis, 522
  - extent of pseudo-membrane in croup, 461

- HALL, Marshall, on treatment of internal convulsions, 414
  - on spurious hydrocephalus, 365
- Hall, Prof., case of unusual lactation, 45
- Hammond, Prof., on maternal emotions, 22
- Harris, Dr. Elisha, prevention of scarlet fever, 200
- Hassel, Dr., on Liebig's soup, 717
- Hawley's pepsin, 573
- Heart, diseases of, 674
- Heimacy, tetanus in, 386
- Helmerich's ointment, 713
- Hemorrhage, intra-cranial, 319
    - causes, 319
    - anatomical characters, 320
    - meningeal, 321
    - cerebral, 323
    - symptoms, 324
    - capillary, 327
    - diagnosis, 328
    - prognosis, 329
    - treatment, 329
  - umbilical, 72
    - causes, 73
    - sex, age, 73
    - jaundice in cases of, 74
    - symptoms, 75
    - prognosis, 75
    - treatment, 75
  - gastro-intestinal, 646
    - first variety, 647
    - second variety, 648
    - third variety, 649
      - case, 648
    - prognosis, 650
    - treatment, 650
- Hewitt, Dr. Graily, case of post-mortem digestion, 567
- Hillier, on choreic heart murmurs, 415
  - causes of urticaria, 701
- Hogarth's essence of meat, 720
- Holmes, on scrofulous affections, 113
- Hooping-cough, 247
- Hutchinson, on syphilis, 155
- Hydrocephalus, congenital, 330
    - anatomical characters, 331
      - case, 334
- Hydrocephalus, congenital—
    - symptoms, 334
    - diagnosis, 336
    - prognosis, 337
    - treatment, 337
  - acquired, 338
    - causes, 338
    - anatomical characters, 335
    - symptoms, 340
    - prognosis, 340
    - treatment, 341
  - spurious, 363
    - anatomical characters, 363
      - case, 364
    - symptoms, 365
      - case, 366, 367
    - diagnosis, 368
    - prognosis, 368
    - treatment, 369
- Hypertrophy of brain, 302
  - anatomy, 303
  - causes, 304
  - symptoms, 305
    - case, 306
  - diagnosis, 307
  - prognosis, 307
  - treatment, 307

- ICTERUS of the new-born, 76
- Impetigo, syphilitic, 153
- Imperfect brain, 299
  - case, 300
  - symptoms, 300
  - prognosis, 301
- Indigestion, 567
  - causes, 568
  - symptoms, 569
  - prognosis, 571
  - treatment, 571
- Infancy, 17
  - its anatomical characters, 17
  - causes of great mortality in, 18
- Inflammation of stomach, 574
  - of umbilicus, 70
- Intermittent fever, 263
  - in fœtus, 263
  - symptoms, 264
  - three stages of paroxysms, 264
  - congestive or pernicious, 265
  - treatment, 266
- Internal convulsions, 405
  - causes, 406
  - anatomical characters, 408
  - symptoms, 409
    - case, 410
  - diagnosis, 411
  - prognosis, 411
  - treatment, 412
- Intestines, inflammation of, 592
  - invagination of, 652
- Intestinal inflammation, 592
    - causes, 594
    - age, 598
    - symptoms, 599

- Intestinal inflammation—
    - anatomical characters, 602
    - diagnosis, 609
    - prognosis, 609
    - treatment, 610
        - regimenal, 610
        - medicinal, 613
        - enemata, 616
    - external treatment, 619
- Intestinal worms, 633
    - ascaris lumbricoides, 634
        - vermicularis, 636
    - trichocephalus dispar, 636
    - tænia, 636
        - causes, 637
        - symptoms, 639
        - diagnosis, 416
        - prognosis, 642
        - treatment, 643
- Intussusception, 652
    - without symptoms, 652
    - with symptoms, 653
    - previous health, 653
    - causes, 654
    - age, 655
    - seat and pathological anatomy, 656
    - of small intestines, 656
        - cases, 657
    - in large intestines, 659
        - symptoms, 652
        - diagnosis, 665
        - duration, 665
        - prognosis, 666
        - mode of death, 668
        - treatment, 668
- Iodine in scrofula, 119

- JACKSON, Dr. James, on treatment of bronchitis, 486
    - on second dentition, 554
    - treatment of cholera infantum, 631
- Jacobi, Prof. A., on laryngismus, 407
    - statistics of croup, 472
- Jaundice in the new-born, 76
- Jenkins, Dr. J. Foster, on umbilical hemorrhage, 72
- Jenner, Edward, introduction of vaccination, 213
- Jenner, Sir Wm., heart murmurs in chorea, 415
- Jesty, Benjamin, the first vaccinator, 213

- KERMES mineral, a cause of gastritis, 575
- Kilda, St., tetanus in, 386
- Krackowizer, Dr., cases of tracheotomy in croup, 472

- LACTATION, 28
    - course of, 54
    - hindrances to, 29
- Lactation—
    - facts and rules in reference to, 33
- Lanugo, 17
- Laryngitis, simple, acute, 449
        - symptoms, 449
        - chronic, 450
        - anatomical characters, 451
        - treatment, 451
    - spasmodic, 452
        - causes, 452
        - symptoms, 452
        - anatomical characters, 454
        - pathology, 454
        - diagnosis, 454
        - prognosis, 455
        - treatment, 455
    - pseudo-membranous, 458
        - causes, 459
        - anatomical characters, 459
        - symptoms, 462
        - pathological characters, 464
        - diagnosis, 465
        - prognosis, 465
        - treatment, 466
        - tracheotomy, 472
- Leaming, Dr. J. R., case of erysipelas, 288
- Lewis, Dr. Caspar, use of raw meat, 718
- Liebig's beef-tea, 719
    - soup, 716
- Liver, its state in entero-colitis, 607
- Livingston, Dr., case of peri-pharyngeal abscess, 565
- Lungs, tubercles in, 129

- MALFORMATIONS, a cause of death, 24
- Maternal emotions, effect of, in pregnancy, 20
- Measles, 159
    - symptoms, 159
    - anomalies, 162
    - complications, 163
    - anatomical characters, 166
    - nature, 166
    - diagnosis, 166
    - prognosis, 167
    - treatment, 167
- Meigs, Dr. J. F., on chenopodium as an anthelmintic, 644
    - and Pepper, Drs., treatment of chronic coryza, 448
- Meningitis, simple and tubercular, 342
    - age, 344
    - anatomical characters, 344
    - causes 349
    - premonitory stage, 349
    - symptoms, 350
        - case, 355
    - diagnosis, 356
    - prognosis, 357
    - treatment, 359
- Microcephalus, 301
- Milk, human, 36

- Milk—
  - modifications, from diet, 36
    - from retention in breast, 38
    - by age and nervous impressions, 34
    - by catamenia and pregnancy, 40
  - quantity, required, 41
  - scantiness, 43
  - examination of, 51
  - excess of salines in, 53
  - vibriones in, 52
  - its composition, 58
  - of animals, 58
- Minchin's mode of examining milk, 51
- Minot, Dr. Francis, on umbilical hemorrhage, 72
- Morbilli, 159
- Mortality of early life, 23
  - causes, 24–28
- Mother, care of, in pregnancy, 20
  - effect of maternal impressions, 21
- Mouth, inflammation of cavity of, 524
- Movements in disease, 79
- Mucuna pruriens as an anthelmintic, 645
- Muguet, 533
- Mumps, 261

- NECROSIS, infantilis, 538
- Nephritis in scarlatina, 180
- Nervous system, 88
- Nestlé's food, 59
- Noma, 538
- Noyes, Prof. H. D., on use of ophthalmoscope, 296

- ŒSOPHAGITIS, 566
  - anatomical characters, 566
  - treatment, 567
- Oidium albicans in sprue, 534
- Ophthalmia neonatorum, 65
  - two forms, 67
  - symptoms, 66
  - treatment, 67
- Ophthalmoscope in diseases of brain, 296
- Osteo-malacia, 92
- Otitis, scrofulous, 112
- Otorrhœa, 182

- PAIN as a symptom, 88
- Papulæ, 702
- Paralysis, diphtheritic, 240
  - facial, 440
    - causes, 440
    - symptoms, 440
    - prognosis, 440
    - treatment, 441
- Paralysis, infantile, 431
  - causes, 431
  - symptoms, 432
  - prognosis, 433
  - progress, 433
  - etiology, 434
- Paralysis, infantile—
  - anatomical characters, 435
  - diagnosis, 437
  - prognosis, 437
  - treatment, 438
- Paralysis with apparent hypertrophy, 441
  - symptoms, 442
  - anatomical characters, 443
  - causes, 444
  - prognosis, 444
  - treatment, 444
- Parker, Dr. E. H., treatment of entero-colitis, 613
  - lesions of cholera infantum, 629
- Parker, Prof. Willard, case of peri-pharyngeal abscess, 564
- Parotiditis, 261
  - symptoms, 261
  - nature, 262
  - diagnosis, 262
  - treatment, 262
- Peacock, on growth of brain, 297
- Pemphigus, syphilitic, 153
- Pepsin in indigestion, 573
- Peritoneal tuberculosis, 133
- Peritonitis, tubercular, 133
- Peri-pharyngeal abscess, 559
  - age, 559
  - causes, 559
  - anatomical characters, 561
  - symptoms, 561
    - case, 562
  - duration, 563
  - diagnosis, 564
  - prognosis, 565
  - treatment, 565
- Pertussis, 247
  - symptoms, 247
  - three stages, 248
  - complications, 250
  - convulsions, 250
  - bronchitis, 251
  - pneumonitis, 251
  - emphysema, 252
  - diagnosis, 253
  - prognosis, 254
  - treatment, 255
    - belladonna, 256
    - hydrocyanic acid, 257
    - bromides, 258
    - emetics, 259
- Pharyngitis, simple, 555
  - anatomical characters, 555
  - causes, 556
  - symptoms, 556
  - prognosis 557
  - diagnosis, 557
  - treatment, 557
- Phthisis, 122
- Phlebitis, umbilical, 69
- Pleuritis, 507
  - causes, 508
  - cases, 510, 517
  - anatomical characters, 511
  - symptoms, 513

- Pleuritis—
  - physical signs, 514
  - diagnosis, 517
  - prognosis, 518
  - treatment, 519
  - thoracentesis, 521
- Pneumonitis, 490
  - causes, 491
  - anatomical characters, 493
    - croupous, 494
    - catarrhal, 495
    - cheesy, 407
  - symptoms, 499
  - physical signs, 501
  - diagnosis, 502
  - prognosis, 504
  - treatment, 504
  - in measles, 164
- Post-mortem digestion, 580
- Pock, vaccine, its anatomy, 217
- Post, Prof. A., case of peri-pharyngeal abscess, 564
- Pregnancy, its effect on the milk, 40
- Protection from vaccination, 221
- Pulmonary cavities, 131
  - tuberculosis, 129
- Pulse in health, 82
  - in disease, 84

- RACHITIS, 91
  - causes, 93
  - age, 91
  - anatomical characters, 94
  - craniotabes, 96
  - curvatures, 97
  - symptoms, 100
  - complications, 102
  - diagnosis, 103
  - prognosis, 103
  - treatment, 104
- Radcliffe, Mr., on treatment of chorea, 430
- Remittent fever, 267
  - symptoms, 268
  - diagnosis, 268
  - treatment, 268
- Respiration in health, 80
  - in disease, 81
- Respiratory system in children, 80
  - diseases of, 445
- Retro-pharyngeal abscess, 559
- Revaccination, 221
- Reynolds, Dr. J. B., case of diphtheria, 240
- Rheumatism, acute, 277
  - its frequency in children, 277
  - causes, 278
  - symptoms, 278
  - complications, 280
  - duration, 280
  - prognosis, 280
  - diagnosis, 281
  - treatment, 282
- Ricinus communis, as a galactogogue, 47
- Rickets, 91
- Rokitansky on hypertrophy of brain, 304
- Roseola, 698
  - symptoms, 699
  - causes, 700
  - prognosis, 700
  - diagnosis, 700
  - treatment, 700
- Routh, Dr., mortality from change of temperature, 26
  - plethora, a cause of insufficient milk, 44
- Rubeola, 159

- SCABIES, 711
  - acarus scabiei, 711
  - symptoms, 712
  - diagnosis, 712
  - treatment, 713
- Scantinesss of milk, 43
- Scarlatina, 169
  - symptoms, 169
  - irregular form, 173
  - malignant form, 174
  - complications, 175
  - sequelæ, 178
  - nephritis, 182
  - otorrhœa, 182
  - anatomical characters, 183
  - nature, 183
  - incubative period, 185
  - diagnosis, 187
  - prognosis, 188
  - treatment, 189
  - prophylaxis, 198
- Scrofula, 104
  - causes, 105
  - vaccination as a cause, 106
  - communicability, 106
  - anatomical characters, 109
  - symptoms, 110
  - coryza, 112
  - otitis, 112
  - cellulitis, 111
  - its relation to tuberculosis, 114
  - prognosis, 117
  - treatment, 118
- Scrofulous affections, 113
- Seguin, Dr., effect of maternal emotions on fœtus, 23
- Skene, Prof., case of tænia, 637
- Skin diseases, 695
- Smallpox, 201
- Smith, Prof. Stephen, on umbilical hemorrhage, 72
  - operation for congenital hydrocephalus, 336
- Softening, gastro-intestinal, 580
- Spasm of glottis, 405
- Spigelia marilandica, as an anthelmintic, 643
- Sprue, 535
- Steam, its employment in croup, 469
- Stillé, Dr. Moreton, on cyanosis, 677

Stomach, congestion of, 574
  inflammation of, 566
  tubercles in, 133
Stomatitis, simple, 524
    causes, 524
    symptoms, 526
    appearances, 526
    treatment, 527
  ulcerous, 527
    causes, 528
    symptoms, 557
    prognosis, 529
    treatment, 529
  follicular, 530
    causes, 531
    symptoms, 531
    diagnosis, 532
    prognosis, 532
    treatment, 232
Strabismus, 78
Strophulus, 702
  varieties, 702
  causes, 703
  treatment, 703
St. Guy's dance, 415
St. Vitus' dance, 415
Strychnine in treatment of chorea, 428
Swett, Prof., case of hemorrhage, 649
Swinepox, 224
Syphilis, 149
  etiology, 149
  clinical history, 150
  coryza, 152
  mucous patches, 152
  roseola, 153
  pemphigus, 153
  acne, 153
  impetigo, 153
  ecthyma, 153
  visceral lesions, 154
  prognosis, 156
  treatment, 156

TÆNIA, 636
Teething, 546
Temperature, 85
Tetanus infantum, 382
  cases, 383
  period of commencement, 385
  frequency, 385
  causes, 387
    uncleanliness, 388
    irritation in bowels, 388
    changes of temperature, 389
    inflammation of umbilical vessels, 390
    meningitis, 393
    injury of brain, 395
  anatomical characters, 396
  symptoms, 398
  mode of death, 400
  prognosis, 400
  duration of fatal cases, 401
    of favorable cases, 402
Tetanus infantum—
  diagnosis, 402
  preventive treatment, 402
  treatment, 403
Thorax, shape, in tuberculosis, 142
Thrombosis in cranial sinuses, 308
  causes, 311
  anatomical characters, 309
  symptoms, 312
  diagnosis, 313
  prognosis, 313
  treatment, 313
Thrush, 533
  anatomical characters, 533
  symptoms, 535
  causes, 535
  diagnosis, 536
  prognosis, 536
  treatment, 536
Thymic asthma, 405
Trismus, 382
Trousseau, on syphilitic tint, 151
Tuberculosis, 122
  its relation to scrofula, 115
    etiology, 123
    anatomical characters, 126
    symptoms, 135
      anasarca, 136
      emaciation, 136
      fever, 136
      in bronchial phthisis, 139
      in pulmonary phthisis, 140
      in tubercles of pleura, 143
      in gastric and intestinal tubercles, 144
    diagnosis, 144
    prognosis, 147
    treatment, 148
Tubercles in lungs, 128
  stomach, 133
  intestines, 133
  bronchial glands, 131
Typhoid fever, 269
  causes, 269
  anatomical characters, 270
  symptoms, 271
  complications, 273
  diagnosis, 274
  duration, 275
  prognosis, 275
  treatment, 276

ULCERATION of umbilicus, 70
Umbilicus, diseases, 69
  inflammation of vessels, 69
    of umbilicus, 70
  ulceration of, 70
    treatment, 71
    granulations, 71
  fungus, 71
  hemorrhage, 72
  inflammation of, 284
Urticaria, 701
  causes, 701

Urticaria—
  prognosis, 701
  diagnosis, 701
  treatment, 702

VACCINATIONS, subsequent, 220
  spurious, 221
Vaccinia, 212
  history of, 213
  appearance, 216
  symptoms, 216
  anomalies, 217
  complications, 217
  sequels, 217
  subsequent vaccinations, 220
  protection from, 216, 221
  revaccination, 221
  selection of virus, 223
Varicella, 224
  symptoms of, 224
  diagnosis, 225
  prognosis and treatment, 226
Variola, 201
  incubative period, 201
  stage of invasion, 201
    of eruption, 202
    of desiccation, 204
Varioloid, 205
  mode of death, 206
  anatomical characters, 207
  complications, 208
Varioloid—
  prognosis, 208
  diagnosis, 209
  treatment, 209
Vibriones in milk, 52
Villemin on origin of tubercles, 124
Virus, vaccine, its selection, 223
Voice in disease, 79
Voss, Dr., cases of tracheotomy in croup, 472

WARE, Dr., statistics of croup, 461
  Waxy degeneration in rachitis, 99
Weaning, 54
  age for, 55
  mode, 56
West, Dr. Chas., case of thrombosis, 310
  treatment of chorea, 429
  on gelatinous softening, 581
Wet-nurse, selection of, 49
  syphilis in, 50
Whitehead, Dr., effect of maternal emotions on the fœtus, 22
White softening, gastro-intestinal, 580
White, Prof. J. P., case of cyanosis, 694
Whytt, Dr., on meningitis, 341
Worms intestinal, 633

ZINC, oxide of, in eczema, 710

THE END.

THOMAS ON DISEASES OF WOMEN.—Now Ready.

A PRACTICAL TREATISE

ON THE DISEASES OF WOMEN.

BY T. GAILLARD THOMAS, M.D.,

Professor of Obstetrics and Diseases of Women and Children in the College of Physicians and Surgeons, New York; Obstetric Physician to the Strangers' and the Roosevelt Hospitals; Consulting Physician to the N. Y. State Women's Hospital, &c.

With about Two Hundred and Fifty Illustrations.

THIRD EDITION, ENLARGED AND THOROUGHLY REVISED.

In one large and handsome octavo volume of 784 pages: leather, $6 00; cloth, $5 00.

The exhaustion of two very large editions in a little more than three years shows that the author has not failed in his endeavor to supply the admitted want of a work which should, in a moderate compass, furnish a complete view of all the modern aspects of gynæcology. Stimulated by the very favorable reception accorded to his labors, he has sought to render the present edition still more worthy than its predecessors. Every portion of the work has been thoroughly revised, several new chapters and a number of new illustrations have been introduced, and the most painstaking care has been bestowed to make it a full and trustworthy guide for the student and practitioner. To accommodate the numerous additions the size of the page has been enlarged, notwithstanding which the number of pages has been increased by nearly one hundred and fifty; in fact, the present edition contains nearly one-third more matter than the preceding, notwithstanding which it has been kept at the former very moderate price. The work, it is therefore hoped, will continue to maintain its position as the favorite book for consultation by all who have to treat this frequent and important class of diseases.

From Prof. FORDYCE BARKER, *Bellevue Hospital Medical College, New York.*

A work which I estimate very highly and which I have always taken every opportunity to commend to students and the profession. I have carefully looked over this edition, and comparing it with the two former ones, I have been greatly impressed with the conscientious labor, as well as the ability, with which Professor Thomas has kept the work up to represent the advanced and progressing science of the day.

From Prof. DE LASKIE MILLER, *Rush Medical College, Chicago.*

My appreciation of the work is indicated by the fact that I always mention it first when recommending works on this department to students or others.

From Prof. J. ALGERNON TEMPLE, *Trinity College, Toronto.*

I can only say that in my opinion it is now the most complete work of its kind. The well-known reputation of the author and the many improvements in this edition place it in the foremost rank of medical literature. I shall have great pleasure in recommending it to my class.

From Prof. ALEX. J. C. SKENE, *Long Island College Hospital.*

This edition shows that the professor is determined to keep fully up to the times. I shall have the pleasure of continuing to recommend this work to my class of students as the best on the subject to be found anywhere.

From Prof. J. S. D. CULLEN, *Medical College of Virginia.*

A work which I prize very much both for the text and for the admirable manner in which it is published. It is the text-book which I recommend to my class and to my professional friends.

From Prof. F. M. ROBERTSON, *Charleston Medical College.*

I have no doubt that I shall find it worthy of even greater commendation than the preceding editions, as I find that it has been greatly enlarged and brought fully up with the times.

From Prof. FRANK WELLS, *Cleveland Medical College.*

The book has been for some time used in our school, and on the perusal of the new edition I am led to more strongly than ever recommend it to the students and to the practitioners of our city as a work furnishing a very comprehensive treatise on the subject.

From Prof. A. F. A. KING, *National Medical College, Washington, D. C.*

On referring to it for advice in regard to some difficult cases now under treatment I have been delighted with its practical character, and shall take pleasure in recommending it as a text-book to my class.

From Prof. J. C. SHRADER, *Iowa State University.*

I shall take great pleasure in recommending it to the students in the Medical Department of the Iowa State University, as the standard work on gynæcology.

Its able author need not fear comparison between it and any similar work in the English language; nay more, as a text-book for students and as a guide for practitioners, we believe it is unequalled. In the libraries of reading physicians we meet with it oftener than any other treatise on diseases of women. We conclude our brief review by repeating the hearty commendation of this volume given when we commenced: if either student or practitioner can get but one book on diseases of women, that book should be "Thomas"—*Am. Journ. Med. Sciences*, April, 1872.

Of the work itself, in the original block, we need hardly make any criticism at this date. It has firmly established itself as *the* American text-book of gynæcology. Without being prolix, it treats of the disorders to which it is devoted, fully, perspicuously, and satisfactorily. It will be found a treasury of knowledge to every physician who turns its pages.—*Am. Journ. of Syphilography*, April, 1872.

No book in American medical literature has been so flatteringly received by the profession as this, and no one making the least pretensions to the study of uterine diseases can do without it. For clearness of style and therapeutics, it has no parallel.—*Va. Clin. Record*, April, 1872.

It better represents the present condition of gynæcology than any work in the English language of which we know. Want of space forbids our entering into details; nor is it necessary, for all our readers who are not already supplied with a copy of one of the previous editions will be sure to get this; that is, if at all interested in the treatment of diseases of women.—*American Practitioner*, April, 1872.

HENRY C. LEA, Philadelphia.

WORKS ON DISEASES OF CHILDREN.

SMITH ON WASTING DISEASES OF CHILDREN.

THE WASTING DISEASES OF INFANTS AND CHILDREN.

By EUSTACE SMITH, M.D.

Second American, from the Second and Enlarged London Edition.

In one very handsome octavo volume of 266 *pages; extra cloth,* $2 50. (*Just Issued.*)

The final chapter on the diet and treatment of children in health and disease will be found especially useful to the junior practitioner, who is often at a loss in the management of children as regards the food to be administered It contains very minute and elaborate directions, and scales of dieting for different ages and conditions. We are glad to be able to recommend this work as one of sterling merit, and one which we have no doubt will be very favorably received and considered by the profession.—*Dublin Quarterly Journal*, Aug. 1871.

As the first edition of this admirable work was reviewed carefully in this journal, it is unnecessary to add much in regard to it. It has been enlarged by the addition of most valuable matter in connection with mucous diarrhœa, and the proper diet for invalid children. The author, as physician to the largest free Dispensary for children in London, has enjoyed an experience equalled by few, and surpassed by none. —*Richmond and Louisville Medical Journal*, Aug. 1871.

In a highly creditable manner the doctor has explored this important field, and has brought out practically the prominent salient points on the causes, diagnosis, prognosis, pathology, morbid anatomy, and the treatment of the diseases of childhood of which wasting is a symptom. The clinical facts thus made applicable give this work a special value. It is a book well worthy of careful perusal, and we would cordially recommend it to those who are interested in the diseases of infancy and childhood.—*The New York Journ. of Psychological Medicine*, April, 1872.

WEST ON CHILDREN.

LECTURES ON THE DISEASES OF INFANCY AND CHILDHOOD.

By CHARLES WEST,

Physician to the Hospital for Sick Children, &c.

FOURTH AMERICAN, FROM THE FIFTH AND REVISED ENGLISH EDITION.

In one large and handsome octavo volume of 656 *pages; cloth,* $4 50; *leather,* $5 50.

All our readers are, doubtless, familiar with Dr. West's admirable volume, and will welcome the appearance of a new edition. No praise is needed of a book so well known, which has placed its author in the first rank of British physicians, and gained him an enduring reputation as an authority on infantile disease.—*Brit. and For. Med.-Chir. Rev.*, Oct. 1870.

The work of West on the Diseases of Children is translated into the chief European languages, and extensively used; and the reason is, we believe, simply, that there is nothing to be found in any language at all equal to it.—*Edinburgh Med. Journal*, May, 1869.

By the same Author—Just Issued.

ON SOME DISORDERS OF THE NERVOUS SYSTEM IN CHILDHOOD.

Being the Lumleian Lectures delivered at the Royal College of Physicians of London, in March, 1871. In one neat volume, small 12mo.; cloth, $1.

With the assurance to our readers that this little book abounds in valuable practical hints which will assist them in the treatment of this, confessedly the most difficult class of disease, we recommend it to their study.—*St. Louis Medical and Surgical Journal*, Jan. 1872.

CONDIE ON CHILDREN.

A PRACTICAL TREATISE ON THE DISEASES OF CHILDREN.

By D. FRANCIS CONDIE, M.D.

SIXTH EDITION, THOROUGHLY REVISED.

In one large and handsome octavo volume of nearly 800 *closely printed pages; extra cloth,* $5 25; *leather,* $6 25.

A work which has passed through five *bona fide* editions, and of which a sixth has been called for, may be regarded as being beyond the bounds of criticism; that high tribunal, the profession, having already recorded a verdict in its favor. All that is needed, in a notice of the present edition of Dr. Condie's well-known treatise, is to state that it has undergone a careful and thorough revision, and the advances recently made in our knowledge of the various diseases of childhood have been carefully incorporated in the several chapters. This will be manifest on a comparison of the present with the previous edition.—*Am. Journ. Med. Sciences*, April, 1865.

GUERSANT ON SURGICAL DISEASES OF CHILDREN.

SURGICAL DISEASES OF INFANTS AND CHILDREN.

By M. P. GUERSANT,

Honorary Surgeon to the Hospital for Sick Children, Paris.

TRANSLATED BY RICHARD J. DUNGLISON, M.D.

This work, now appearing in the "Medical News and Library," will be continued to completion in 1872, when it will be issued separately in a handsome octavo volume of nearly 400 pages. It will be found to contain much which, while of everyday importance to the practitioner, can scarcely be found in the ordinary text-books.

HENRY C. LEA, Philadelphia.

HENRY C. LEA'S

(LATE LEA & BLANCHARD'S)

CLASSIFIED CATALOGUE

OF

MEDICAL AND SURGICAL PUBLICATIONS.

In asking the attention of the profession to the works contained in the following pages, the publisher would state that no pains are spared to secure a continuance of the confidence earned for the publications of the house by their careful selection and accuracy and finish of execution.

The printed prices are those at which books can generally be supplied by booksellers throughout the United States, who can readily procure for their customers any works not kept in stock. Where access to bookstores is not convenient, books will be sent by mail post-paid on receipt of the price, but no risks are assumed either on the money or the books, and no publications but my own are supplied. Gentlemen will therefore in most cases find it more convenient to deal with the nearest bookseller.

An Illustrated Catalogue, of 64 octavo pages, handsomely printed, will be forwarded by mail, postpaid, on receipt of ten cents.

HENRY C. LEA.

Nos. 706 and 708 Sansom St., Philadelphia, March, 1872.

ADDITIONAL INDUCEMENT FOR SUBSCRIBERS TO

THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES.

THREE MEDICAL JOURNALS, containing over 2000 LARGE PAGES,

Free of Postage, for SIX DOLLARS Per Annum.

TERMS FOR 1872:

The American Journal of the Medical Sciences, and The Medical News and Library, both free of postage,	Five Dollars per annum, in advance.

OR,

The American Journal of the Medical Sciences, published quarterly (1150 pages per annum), with The Medical News and Library, monthly (384 pp. per annum), and The Half-Yearly Abstract of the Medical Sciences, published Feb. and August (600 pages per annum), all free of postage.	Six Dollars per annum in advance.

SEPARATE SUBSCRIPTIONS TO

The American Journal of the Medical Sciences, subject to postage when not paid for in advance, Five Dollars.

The Medical News and Library, free of postage, in advance, One Dollar.

The Half-Yearly Abstract, Two Dollars and a Half per annum in advance. Single numbers One Dollar and a Half.

It is manifest that only a very wide circulation can enable so vast an amount of valuable practical matter to be supplied at a price so unprecedentedly low. The publisher, therefore, has much gratification in stating that the rapid and steady increase in the subscription list promises to render the enterprise a permanent one, and it is with especial pleasure that he acknowledges the valuable assistance spontaneously rendered by so many of the old subscribers to the "Journal," who have kindly made known among their friends the advantages thus offered and have induced them to subscribe. Relying upon a continuance of these friendly exertions, he hopes to be able to maintain the unexampled rates at which these works are now supplied, and to succeed in his endeavor to place upon the table of every reading practitioner in the United States a monthly, a quarterly, and a half-yearly periodical at the comparatively trifling cost of SIX DOLLARS *per annum.*

These periodicals are universally known for their high professional standing in their several spheres.

I.

THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES,

EDITED BY ISAAC HAYS, M. D.,

is published Quarterly, on the first of January, April, July, and October. Each number contains nearly three hundred large octavo pages, appropriately illustrated, wherever necessary. It has now been issued regularly for nearly FIFTY years, during almost the whole of which time it has been under the control of the present editor. Throughout this long period, it has maintained its position in the highest rank of medical periodicals both at home and abroad, and has received the cordial support of the entire profession in this country. Among its Collaborators will be found a large number of the most distinguished names of the profession in every section of the United States, rendering the department devoted to

ORIGINAL COMMUNICATIONS

full of varied and important matter, of great interest to all practitioners. Thus, during 1871, articles have appeared in its pages from ninety-eight gentlemen of the highest standing in the profession throughout the United States.*

Following this is the "REVIEW DEPARTMENT," containing extended and impartial reviews of all important new works, together with numerous elaborate "ANALYTICAL AND BIBLIOGRAPHICAL NOTICES" of nearly all the medical publications of the day.

This is followed by the "QUARTERLY SUMMARY OF IMPROVEMENTS AND DISCOVERIES IN THE MEDICAL SCIENCES," classified and arranged under different heads, presenting a very complete digest of all that is new and interesting to the physician, abroad as well as at home.

Thus, during the year 1871, the "JOURNAL" furnished to its subscribers One Hundred and Twenty-two Original Communications, Sixty-four Reviews and Bibliographical Notices, and Three Hundred and five articles in the Quarterly Summaries, making a total of about FIVE HUNDRED articles emanating from the best professional minds in America and Europe.

That the efforts thus made to maintain the high reputation of the "JOURNAL" are successful, is shown by the position accorded to it in both America and Europe as a national exponent of medical progress:—

Dr. Hays keeps his great *American Quarterly*, in which he is now assisted by Dr. Minis Hays, at the head of his country's medical periodicals.—*Dublin Medical Press and Circular*, March 5, 1871.

Of English periodicals the *Lancet*, and of American the *Am. Journal of the Medical Sciences*, are to be regarded as necessities to the reading practitioner.—*N. Y. Medical Gazette*, Jan. 7, 1871.

The *American Journal of the Medical Sciences* yields to none in the amount of original and borrowed matter it contains, and has established for itself a reputation in every country where medicine is cultivated as a science.—*Brit. and For. Med.-Chirurg Review*, April, 1871.

One of the best of its kind.—*London Lancet*, Aug. 20, 1870.

Almost the only one that circulates everywhere, all over the Union and in Europe.—*London Medical Times*, Sept. 5, 1868.

The subscription price of the "AMERICAN JOURNAL OF THE MEDICAL SCIENCES" has never been raised, during its long career. It is still FIVE DOLLARS per annum; and when paid for in advance, the subscriber receives in addition the "MEDICAL NEWS AND LIBRARY," making in all about 1500 large octavo pages per annum, free of postage.

II.

THE MEDICAL NEWS AND LIBRARY

is a monthly periodical of Thirty-two large octavo pages, making 384 pages per annum. Its "NEWS DEPARTMENT" presents the current information of the day, with Clinical Lectures and Hospital Gleanings; while the "LIBRARY DEPARTMENT" is devoted to publishing standard works on the various branches of medical science, paged separately, so that they can be removed and bound on completion. In this manner subscribers have received, without expense, such works as "WATSON'S PRACTICE," "TODD AND BOWMAN'S PHYSIOLOGY," "WEST ON CHILDREN," "MALGAIGNE'S SURGERY," &c. &c. And in 1872 will be continued to completion the valuable practical treatise of M. P. GUERSANT on the SURGICAL DISEASES OF CHILDREN, translated by R. J. DUNGLISON, M. D.

---

* Communications are invited from gentlemen in all parts of the country. Elaborate articles inserted by the Editor are paid for by the Publisher.

As stated above, the subscription price of the "MEDICAL NEWS AND LIBRARY" is ONE DOLLAR per annum in advance; and it is furnished without charge to all advance paying subscribers to the "AMERICAN JOURNAL OF THE MEDICAL SCIENCES."

III.

THE HALF-YEARLY ABSTRACT OF THE MEDICAL SCIENCES

is issued in half-yearly volumes, which will be delivered to subscribers about the first of February, and first of August. Each volume contains about 300 closely printed octavo pages, making about six hundred pages per annum.

"RANKING'S ABSTRACT" has now been published in England regularly for more than twenty years, and has acquired the highest reputation for the ability and industry with which the essence of medical literature is condensed into its pages. It purports to be "*A Digest of British and Continental Medicine, and of the Progress of Medicine and the Collateral Sciences,*" and it is even more than this, for America is largely represented in its pages. It draws its material not only from all the leading American, British, and Continental journals, but also from the medical works and treatises issued during the preceding six months, thus giving a complete digest of medical progress. Each article is carefully condensed, so as to present its substance in the smallest possible compass, thus affording space for the very large amount of information laid before its readers. The volumes of 1871, for instance, have contained

FORTY-FIVE ARTICLES ON GENERAL QUESTIONS IN MEDICINE.
ONE HUNDRED AND THIRTY ARTICLES ON SPECIAL QUESTIONS IN MEDICINE.
ELEVEN ARTICLES ON FORENSIC MEDICINE
ONE HUNDRED AND THREE ARTICLES ON THERAPEUTICS.
FORTY-THREE ARTICLES ON GENERAL QUESTIONS IN SURGERY.
ONE HUNDRED AND TWENTY-ONE ARTICLES ON SPECIAL QUESTIONS IN SURGERY.
EIGHTY-EIGHT ARTICLES ON MIDWIFERY AND DISEASES OF WOMEN AND CHILDREN.
FIVE ARTICLES IN APPENDIX.

Making in all over five hundred and fifty articles in a single year. Each volume, moreover, is systematically arranged, with an elaborate Table of Contents and a very full Index, thus facilitating the researches of the reader in pursuit of particular subjects, and enabling him to refer without loss of time to the vast amount of information contained in its pages.

The subscription price of the "ABSTRACT," mailed free of postage, is TWO DOLLARS AND A HALF per annum, payable in advance. Single volumes, $1 50 each.

As stated above, however, it will be supplied in conjunction with the "AMERICAN JOURNAL OF THE MEDICAL SCIENCES" and the "MEDICAL NEWS AND LIBRARY," the whole *free of postage*, for SIX DOLLARS PER ANNUM IN ADVANCE.

For this small sum the subscriber will therefore receive three periodicals costing separately Eight Dollars and a Half, each of them enjoying the highest reputation in its class, containing in all over TWO THOUSAND PAGES of the choicest reading, and presenting a complete view of medical progress throughout both hemispheres.

In this effort to bring so large an amount of practical information within the reach of every member of the profession, the publisher confidently anticipates the friendly aid of all who are interested in the dissemination of sound medical literature. He trusts, especially, that the subscribers to the "AMERICAN MEDICAL JOURNAL" will call the attention of their acquaintances to the advantages thus offered, and that he will be sustained in the endeavor to permanently establish medical periodical literature on a footing of cheapness never heretofore attempted.

PREMIUM FOR NEW SUBSCRIBERS.

Any gentleman who will remit the amount for two subscriptions for 1872, one of which must be for a *new subscriber*, will receive as a PREMIUM, free by mail, a copy of the new edition of TANNER'S CLINICAL MANUAL, for advertisement of which see p. 5, or of CHAMBERS' RESTORATIVE MEDICINE (see p. 17), or WEST ON NERVOUS DISORDERS OF CHILDREN (see p. 21).

⁂ Gentlemen desiring to avail themselves of the advantages thus offered will do well to forward their subscriptions at an early day, in order to insure the receipt of complete sets for the year 1871, as the constant increase in the subscription list almost always exhausts the quantity printed shortly after publication.

☞ The safest mode of remittance is by bank check or postal money order, drawn to the order of the undersigned. Where these are not accessible, remittances for the "JOURNAL" may be made at the risk of the publisher, by forwarding in REGISTERED letters. Address,

HENRY C. LEA,
NOS. 706 and 708 SANSOM ST., PHILADELPHIA, PA.

DUNGLISON (ROBLEY), M.D.,

Professor of Institutes of Medicine in Jefferson Medical College, Philadelphia.

MEDICAL LEXICON; A DICTIONARY OF MEDICAL SCIENCE: Containing a concise explanation of the various Subjects and Terms of Anatomy, Physiology, Pathology, Hygiene, Therapeutics, Pharmacology, Pharmacy, Surgery, Obstetrics, Medical Jurisprudence, and Dentistry. Notices of Climate and of Mineral Waters; Formulæ for Officinal, Empirical, and Dietetic Preparations; with the Accentuation and Etymology of the Terms, and the French and other Synonymes; so as to constitute a French as well as English Medical Lexicon. Thoroughly Revised, and very greatly Modified and Augmented. In one very large and handsome royal octavo volume of 1048 double-columned pages, in small type; strongly done up in extra cloth, $6 00; leather, raised bands, $6 75.

The object of the author from the outset has not been to make the work a mere lexicon or dictionary of terms, but to afford, under each, a condensed view of its various medical relations, and thus to render the work an epitome of the existing condition of medical science. Starting with this view, the immense demand which has existed for the work has enabled him, in repeated revisions, to augment its completeness and usefulness, until at length it has attained the position of a recognized and standard authority wherever the language is spoken. The mechanical execution of this edition will be found greatly superior to that of previous impressions. By enlarging the size of the volume to a royal octavo, and by the employment of a small but clear type, on extra fine paper, the additions have been incorporated without materially increasing the bulk of the volume, and the matter of two or three ordinary octavos has been compressed into the space of one not unhandy for consultation and reference.

It would be a work of supererogation to bestow a word of praise upon this Lexicon. We can only wonder at the labor expended, for whenever we refer to its pages for information we are seldom disappointed in finding all we desire, whether it be in accentuation, etymology, or definition of terms.—*New York Medical Journal*, November, 1865.

It would be mere waste of words in us to express our admiration of a work which is so universally and deservedly appreciated. The most admirable work of its kind in the English language. As a book of reference it is invaluable to the medical practitioner, and in every instance that we have turned over its pages for information we have been charmed by the clearness of language and the accuracy of detail with which each abounds. We can most cordially and confidently commend it to our readers.—*Glasgow Medical Journal*, January, 1866.

A work to which there is no equal in the English language.—*Edinburgh Medical Journal.*

It is something more than a dictionary, and something less than an encyclopædia. This edition of the well-known work is a great improvement on its predecessors. The book is one of the very few of which it may be said with truth that every medical man should possess it.—*London Medical Times*, Aug. 26, 1865.

Few works of the class exhibit a grander monument of patient research and of scientific lore. The extent of the sale of this lexicon is sufficient to testify to its usefulness, and to the great service conferred by Dr. Robley Dunglison on the profession, and indeed on others, by its issue.—*London Lancet*, May 13, 1865.

The old edition, which is now superseded by the new, has been universally looked upon by the medical profession as a work of immense research and great value. The new has increased usefulness; for medicine, in all its branches, has been making such progress that many new terms and subjects have recently been introduced: all of which may be found fully defined in the present edition. We know of no other dictionary in the English language that can bear a comparison with it in point of completeness of subjects and accuracy of statement.—*N. Y. Druggists' Circular*, 1865.

For many years Dunglison's Dictionary has been the standard book of reference with most practitioners in this country, and we can certainly commend this work to the renewed confidence and regard of our readers.—*Cincinnati Lancet*, April, 1865.

It is undoubtedly the most complete and useful medical dictionary hitherto published in this country.—*Chicago Med. Examiner*, February, 1865.

What we take to be decidedly the best medical dictionary in the English language. The present edition is brought fully up to the advanced state of science. For many a long year "Dunglison" has been at our elbow, a constant companion and friend, and we greet him in his replenished and improved form with especial satisfaction.—*Pacific Med. and Surg. Journal*, June 27, 1865.

This is, perhaps, the book of all others which the physician or surgeon should have on his shelves. It is more needed at the present day than a few years back.—*Canada Med. Journal*, July, 1865.

It deservedly stands at the head, and cannot be surpassed in excellence.—*Buffalo Med. and Surg. Journal*, April, 1865.

We can sincerely commend Dr. Dunglison's work as most thorough, scientific, and accurate. We have tested it by searching its pages for new terms, which have abounded so much of late in medical nomenclature, and our search has been successful in every instance. We have been particularly struck with the fulness of the synonymy and the accuracy of the derivation of words. It is as necessary a work to every enlightened physician as Worcester's English Dictionary is to every one who would keep up his knowledge of the English tongue to the standard of the present day. It is, to our mind, the most complete work of the kind with which we are acquainted.—*Boston Med. and Surg. Journal*, June 22, 1865.

We are free to confess that we know of no medical dictionary more complete; no one better, if so well adapted for the use of the student; no one that may be consulted with more satisfaction by the medical practitioner.—*Am. Jour. Med. Sciences*, April, 1865.

The value of the present edition has been greatly enhanced by the introduction of new subjects and terms, and a more complete etymology and accentuation, which renders the work not only satisfactory and desirable, but indispensable to the physician.—*Chicago Med. Journal*, April, 1865.

No intelligent member of the profession can or will be without it.—*St. Louis Med. and Surg. Journal*, April, 1865.

It has the rare merit that it certainly has no rival in the English language for accuracy and extent of references.—*London Medical Gazette.*

HOBLYN (RICHARD D.), M.D.

A DICTIONARY OF THE TERMS USED IN MEDICINE AND THE COLLATERAL SCIENCES. Revised, with numerous additions, by ISAAC HAYS, M.D., Editor of the "American Journal of the Medical Sciences." In one large royal 12mo. volume of over 500 double-columned pages; extra cloth, $1 50; leather, $2 00.

It is the best book of definitions we have, and ought always to be upon the student's table.—*Southern Med. and Surg. Journal.*

NEILL (JOHN), M.D., and SMITH (FRANCIS G.), M.D.,

Prof. of the Institutes of Medicine in the Univ. of Penna.

AN ANALYTICAL COMPENDIUM OF THE VARIOUS BRANCHES OF MEDICAL SCIENCE; for the Use and Examination of Students. A new edition, revised and improved. In one very large and handsomely printed royal 12mo. volume, of about one thousand pages, with 374 wood cuts, extra cloth, $4; strongly bound in leather, with raised bands, $4 75.

The Compend of Drs. Neill and Smith is incomparably the most valuable work of its class ever published in this country. Attempts have been made in various quarters to squeeze Anatomy, Physiology, Surgery, the Practice of Medicine, Obstetrics, Materia Medica, and Chemistry into a single manual; but the operation has signally failed in the hands of all up to the advent of "Neill and Smith's" volume, which is quite a miracle of success. The outlines of the whole are admirably drawn and illustrated, and the authors are eminently entitled to the grateful consideration of the student of every class.—*N. O. Med. and Surg. Journal.*

There are but few students or practitioners of medicine unacquainted with the former editions of this unassuming though highly instructive work. The whole science of medicine appears to have been sifted, as the gold-bearing sands of El Dorado, and the precious facts treasured up in this little volume. A complete portable library so condensed that the student may make it his constant pocket companion.—*Western Lancet.*

In the rapid course of lectures, where work for the students is heavy, and review necessary for an examination, a compend is not only valuable, but it is almost a *sine qua non*. The one before us is, in most of the divisions, the most unexceptionable of all books of the kind that we know of. Of course it is useless for us to recommend it to all last course students, but there is a class to whom we very sincerely commend this cheap book as worth its weight in silver—that class is the graduates in medicine of more than ten years' standing, who have not studied medicine since. They will perhaps find out from it that the science is not exactly now what it was when they left it off.—*The Stethoscope.*

HARTSHORNE (HENRY), M. D.,

Professor of Hygiene in the University of Pennsylvania.

A CONSPECTUS OF THE MEDICAL SCIENCES; containing Handbooks on Anatomy, Physiology, Chemistry, Materia Medica, Practical Medicine, Surgery, and Obstetrics. In one large royal 12mo. volume of 1000 closely printed pages, with over 300 illustrations on wood, extra cloth, $4 50; leather, raised bands, $5 25. (*Just Issued.*)

The ability of the author, and his practical skill in condensation, give assurance that this work will prove valuable not only to the student preparing for examination, but also to the practitioner desirous of obtaining within a moderate compass, a view of the existing condition of the various departments of science connected with medicine.

This work is a remarkably complete one in its way, and comes nearer to our idea of what a Conspectus should be than any we have yet seen. Prof. Hartshorne, with a commendable forethought, intrusted the preparation of many of the chapters on special subjects to experts, reserving only anatomy, physiology, and practice of medicine to himself. As a result we have every department worked up to the latest date and in a refreshingly concise and lucid manner. There are an immense amount of illustrations scattered throughout the work, and although they have often been seen before in the various works upon general and special subjects, yet they will be none the less valuable to the beginner. Every medical student who desires a reliable refresher to his memory when the pressure of lectures and other college work crowds to prevent him from having an opportunity to drink deeper in the larger works, will find this one of the greatest utility. It is thoroughly trustworthy from beginning to end; and as we have before intimated, a remarkably truthful outline sketch of the present state of medical science. We could hardly expect it should be otherwise, however, under the charge of such a thorough medical scholar as the author has already proved himself to be.—*N. York Med. Record*, March 15, 1869.

LUDLOW (J. L.), M. D.

A MANUAL OF EXAMINATIONS upon Anatomy, Physiology, Surgery, Practice of Medicine, Obstetrics, Materia Medica, Chemistry, Pharmacy, and Therapeutics. To which is added a Medical Formulary. Third edition, thoroughly revised and greatly extended and enlarged. With 370 illustrations. In one handsome royal 12mo. volume of 816 large pages, extra cloth, $3 25; leather, $3 75.

The arrangement of this volume in the form of question and answer renders it especially suitable for the office examination of students, and for those preparing for graduation.

TANNER (THOMAS HAWKES), M. D., &c.

A MANUAL OF CLINICAL MEDICINE AND PHYSICAL DIAGNOSIS. Third American from the Second London Edition. Revised and Enlarged by TILBURY FOX, M. D., Physician to the Skin Department in University College Hospital. &c. In one neat volume small 12mo., of about 375 pages, extra cloth. $1 50. (*Just Issued.*)

⁂ By reference to the "Prospectus of Journal" on page 3, it will be seen that this work is offered as a premium for procuring new subscribers to the "AMERICAN JOURNAL OF THE MEDICAL SCIENCES."

Taken as a whole, it is the most compact vade mecum for the use of the advanced student and junior practitioner with which we are acquainted.—*Boston Med. and Surg. Journal*, Sept. 22, 1870.

It contains so much that is valuable, presented in so attractive a form, that it can hardly be spared even in the presence of more full and complete works. The additions made to the volume by Mr. Fox very materially enhance its value, and almost make it a new work. Its convenient size makes it a valuable companion to the country practitioner, and if constantly carried by him, would often render him good service, and relieve many a doubt and perplexity.—*Leavenworth Med. Herald*, July, 1870.

The objections commonly, and justly, urged against the general run of "compends," "conspectuses," and other aids to indolence, are not applicable to this little volume, which contains in concise phrase just those practical details that are of most use in daily diagnosis, but which the young practitioner finds it difficult to carry always in his memory without some quickly accessible means of reference. Altogether, the book is one which we can heartily commend to those who have not opportunity for extensive reading, or who, having read much, still wish an occasional practical reminder.—*N. Y. Med. Gazette*, Nov. 10, 1870.

GRAY (HENRY), F.R.S.,

Lecturer on Anatomy at St. George's Hospital, London.

ANATOMY, DESCRIPTIVE AND SURGICAL. The Drawings by H. V. CARTER, M. D., late Demonstrator on Anatomy at St. George's Hospital; the Dissections jointly by the AUTHOR and DR. CARTER. A new American, from the fifth enlarged and improved London edition. In one magnificent imperial octavo volume, of nearly 900 pages, with 465 large and elaborate engravings on wood. Price in extra cloth, $6 00; leather, raised bands, $7 00. (*Just Issued.*)

The author has endeavored in this work to cover a more extended range of subjects than is customary in the ordinary text-books, by giving not only the details necessary for the student, but also the application of those details in the practice of medicine and surgery, thus rendering it both a guide for the learner, and an admirable work of reference for the active practitioner. The engravings form a special feature in the work, many of them being the size of nature, nearly all original, and having the names of the various parts printed on the body of the cut, in place of figures of reference, with descriptions at the foot. They thus form a complete and splendid series, which will greatly assist the student in obtaining a clear idea of Anatomy, and will also serve to refresh the memory of those who may find in the exigencies of practice the necessity of recalling the details of the dissecting room; while combining, as it does, a complete Atlas of Anatomy, with a thorough treatise on systematic, descriptive, and applied Anatomy, the work will be found of essential use to all physicians who receive students in their offices, relieving both preceptor and pupil of much labor in laying the groundwork of a thorough medical education.

Notwithstanding the enlargement of this edition, it has been kept at its former very moderate price, rendering it one of the cheapest works now before the profession.

The illustrations are beautifully executed, and render this work an indispensable adjunct to the library of the surgeon. This remark applies with great force to those surgeons practising at a distance from our large cities, as the opportunity of refreshing their memory by actual dissection is not always attainable.—*Canada Med Journal*, Aug. 1870.

The work is too well known and appreciated by the profession to need any comment. No medical man can afford to be without it, if its only merit were to serve as a reminder of that which so soon becomes forgotten, when not called into frequent use, viz., the relations and names of the complex organism of the human body. The present edition is much improved. —*California Med Gazette*, July, 1870.

Gray's Anatomy has been so long the standard of perfection with every student of anatomy, that we need do no more than call attention to the improvement in the present edition.—*Detroit Review of Med. and Pharm.*, Aug. 1870.

From time to time, as successive editions have appeared, we have had much pleasure in expressing the general judgment of the wonderful excellence of Gray's Anatomy.—*Cincinnati Lancet*, July, 1870.

Altogether, it is unquestionably the most complete and serviceable text-book in anatomy that has ever been presented to the student, and forms a striking contrast to the dry and perplexing volumes on the same subject through which their predecessors struggled in days gone by.—*N. Y. Med. Record*, June 15, 1870.

To commend Gray's Anatomy to the medical profession is almost as much a work of supererogation as it would be to give a favorable notice of the Bible in the religious press. To say that it is the most complete and conveniently arranged text book of its kind, is to repeat what each generation of students has learned as a tradition of the elders, and verified by personal experience.—*N. Y. Med. Gazette*, Dec. 17, 1870.

SMITH (HENRY H.), M.D., and *HORNER (WILLIAM E.), M.D.,*

Prof. of Surgery in the Univ. of Penna., &c. — *Late Prof. of Anatomy in the Univ. of Penna., &c.*

AN ANATOMICAL ATLAS, illustrative of the Structure of the Human Body. In one volume, large imperial octavo, extra cloth, with about six hundred and fifty beautiful figures. $4 50.

The plan of this Atlas, which renders it so peculiarly convenient for the student, and its superb artistical execution, have been already pointed out. We must congratulate the student upon the completion of this Atlas, as it is the most convenient work of the kind that has yet appeared; and we must add, the very beautiful manner in which it is "got up," is so creditable to the country as to be flattering to our national pride.—*American Medical Journal.*

SHARPEY (WILLIAM), M.D., and *QUAIN (JONES & RICHARD).*

HUMAN ANATOMY. Revised, with Notes and Additions, by JOSEPH LEIDY, M. D., Professor of Anatomy in the University of Pennsylvania. Complete in two large octavo volumes, of about 1300 pages, with 511 illustrations; extra cloth, $6 00.

The very low price of this standard work, and its completeness in all departments of the subject, should command for it a place in the library of all anatomical students.

HODGES, (RICHARD M.), M.D.,

Late Demonstrator of Anatomy in the Medical Department of Harvard University.

PRACTICAL DISSECTIONS. Second Edition, thoroughly revised. In one neat royal 12mo. volume, half-bound, $2 00.

The object of this work is to present to the anatomical student a clear and concise description of that which he is expected to observe in an ordinary course of dissections. The author has endeavored to omit unnecessary details, and to present the subject in the form which many years' experience has shown him to be the most convenient and intelligible to the student. In the revision of the present edition, he has sedulously labored to render the volume more worthy of the favor with which it has heretofore been received.

WILSON (ERASMUS), F.R.S.

A SYSTEM OF HUMAN ANATOMY, General and Special. Edited by W. H. GOBRECHT, M.D., Professor of General and Surgical Anatomy in the Medical College of Ohio. Illustrated with three hundred and ninety-seven engravings on wood. In one large and handsome octavo volume, of over 600 large pages; extra cloth, $4 00; leather, $5 00.

The publisher trusts that the well-earned reputation of this long-established favorite will be more than maintained by the present edition. Besides a very thorough revision by the author, it has been most carefully examined by the editor, and the efforts of both have been directed to introducing everything which increased experience in its use has suggested as desirable to render it a complete text-book for those seeking to obtain or to renew an acquaintance with Human Anatomy. The amount of additions which it has thus received may be estimated from the fact that the present edition contains over one-fourth more matter than the last, rendering a smaller type and an enlarged page requisite to keep the volume within a convenient size. The author has not only thus added largely to the work, but he has also made alterations throughout, wherever there appeared the opportunity of improving the arrangement or style, so as to present every fact in its most appropriate manner, and to render the whole as clear and intelligible as possible. The editor has exercised the utmost caution to obtain entire accuracy in the text, and has largely increased the number of illustrations, of which there are about one hundred and fifty more in this edition than in the last, thus bringing distinctly before the eye of the student everything of interest or importance.

HEATH (CHRISTOPHER), F.R.C.S.,

Teacher of Operative Surgery in University College, London.

PRACTICAL ANATOMY: A Manual of Dissections. From the Second revised and improved London edition. Edited, with additions, by W. W. KEEN, M.D., Lecturer on Pathological Anatomy in the Jefferson Medical College, Philadelphia. In one handsome royal 12mo. volume of 578 pages, with 247 illustrations. Extra cloth, $3 50; leather, $4 00. (*Just Issued.*)

Dr. Keen, the American editor of this work, in his preface, says: "In presenting this American edition of 'Heath's Practical Anatomy,' I feel that I have been instrumental in supplying a want long felt for *a real* dissector's manual," and this assertion of its editor we deem is fully justified, after an examination of its contents, for it is really an excellent work. Indeed, we do not hesitate to say, the best of its class with which we are acquainted; resembling Wilson in terse and clear description, excelling most of the so-called practical anatomical dissectors in the scope of the subject and practical selected matter. . . . In reading this work, one is forcibly impressed with the great pains the author takes to impress the subject upon the mind of the student. He is full of rare and pleasing little devices to aid memory in maintaining its hold upon the slippery slopes of anatomy. —*St. Louis Med. and Surg. Journal*, Mar. 10, 1871.

It appears to us certain that, as a guide in dissection, and as a work containing facts of anatomy in brief and easily understood form, this manual is complete. This work contains, also, very perfect illustrations of parts which can thus be more easily understood and studied; in this respect it compares favorably with works of much greater pretension.

Such manuals of anatomy are always favorite works with medical students. We would earnestly recommend this one to their attention; it has excellences which make it valuable as a guide in dissecting, as well as in studying anatomy.—*Buffalo Medical and Surgical Journal*, Jan. 1871.

The first English edition was issued about six years ago, and was favorably received not only on account of the great reputation of its author, but also from its great value and excellence as a guide-book to the practical anatomist. The American edition has undergone some alterations and additions which will no doubt enhance its value materially. The convenience of the student has been carefully consulted in the arrangement of the text, and the directions given for the prosecution of certain dissections will be duly appreciated.—*Canada Lancet*, Feb. 1871.

This is an excellent Dissector's Manual; one which is not merely a descriptive manual of anatomy, but a guide to the student at the dissecting table, enabling him, though a beginner, to prosecute his work intelligently, and without assistance. The American editor has made many valuable alterations and additions to the original work.—*Am. Journ. of Obstetrics*, Feb. 1871.

MACLISE (JOSEPH).

SURGICAL ANATOMY. By JOSEPH MACLISE, Surgeon. In one volume, very large imperial quarto; with 68 large and splendid plates, drawn in the best style and beautifully colored, containing 190 figures, many of them the size of life; together with copious explanatory letter-press. Strongly and handsomely bound in extra cloth. Price $14 00.

As no complete work of the kind has heretofore been published in the English language, the present volume will supply a want long felt in this country of an accurate and comprehensive Atlas of Surgical Anatomy, to which the student and practitioner can at all times refer to ascertain the exact relative positions of the various portions of the human frame towards each other and to the surface, as well as their abnormal deviations. Notwithstanding the large size, beauty and finish of the very numerous illustrations, it will be observed that the price is so low as to place it within the reach of all members of the profession.

We know of no work on surgical anatomy which can compete with it.—*Lancet.*

The work of Maclise on surgical anatomy is of the highest value. In some respects it is the best publication of its kind we have seen, and is worthy of a place in the library of any medical man, while the student could scarcely make a better investment than this.—*The Western Journal of Medicine and Surgery.*

No such lithographic illustrations of surgical regions have hitherto, we think, been given. While the operator is shown every vessel and nerve where an operation is contemplated, the exact anatomist is refreshed by those clear and distinct dissections, which every one must appreciate who has a particle of enthusiasm. The English medical press has quite exhausted the words of praise, in recommending this admirable treatise. Those who have any curiosity to gratify, in reference to the perfectibility of the lithographic art in delineating the complex mechanism of the human body, are invited to examine our specimen copy. If anything will induce surgeons and students to patronize a book of such rare value and everyday importance to them, it will be a survey of the artistical skill exhibited in these fac-similes of nature.—*Boston Med. and Surg. Journal.*

HORNER'S SPECIAL ANATOMY AND HISTOLOGY. *Eighth edition*, extensively revised and modified. In 2 vols. 8vo., of over 1000 pages, with more than 300 wood-cuts; extra cloth, $6 00.

MARSHALL (*JOHN*), *F. R. S.*,
Professor of Surgery in University College, London, &c.

OUTLINES OF PHYSIOLOGY, HUMAN AND COMPARATIVE.

With Additions by FRANCIS GURNEY SMITH, M. D., Professor of the Institutes of Medicine in the University of Pennsylvania, &c. With numerous illustrations. In one large and handsome octavo volume, of 1026 pages, extra cloth, $6 50; leather, raised bands. $7 50.

In fact, in every respect, Mr. Marshall has presented us with a most complete, reliable, and scientific work, and we feel that it is worthy our warmest commendation.—*St. Louis Med. Reporter*, Jan. 1869.

This is an elaborate and carefully prepared digest of human and comparative physiology, designed for the use of general readers, but more especially serviceable to the student of medicine. Its style is concise, clear, and scholarly; its order perspicuous and exact, and its range of topics extended. The author and his American editor have been careful to bring to the illustration of the subject the important discoveries of modern science in the various cognate departments of investigation. This is especially visible in the variety of interesting information derived from the departments of chemistry and physics. The great amount and variety of matter contained in the work is strikingly illustrated by turning over the copious index, covering twenty-four closely printed pages in double columns.—*Silliman's Journal*, Jan. 1869.

We doubt if there is in the English language any compend of physiology more useful to the student than this work.—*St. Louis Med. and Surg. Journal*, Jan. 1869.

It quite fulfils, in our opinion, the author's design of making it truly *educational* in its character—which is, perhaps, the highest commendation that can be asked.—*Am. Journ. Med. Sciences*, Jan. 1869.

We may now congratulate him on having completed the latest as well as the best summary of modern physiological science, both human and comparative, with which we are acquainted. To speak of this work in the terms ordinarily used on such occasions would not be agreeable to ourselves, and would fail to do justice to its author. To write such a book requires a varied and wide range of knowledge, considerable power of analysis, correct judgment, skill in arrangement, and conscientious spirit. It must have entailed great labor, but now that the task has been fulfilled, the book will prove not only invaluable to the student of medicine and surgery, but serviceable to all candidates in natural science examinations, to teachers in schools, and to the lover of nature generally. In conclusion, we can only express the conviction that the merits of the work will command for it that success which the ability and vast labor displayed in its production so well deserve.—*London Lancet*, Feb. 22, 1868.

If the possession of knowledge, and peculiar aptitude and skill in expounding it, qualify a man to write an educational work, Mr. Marshall's treatise might be reviewed favorably without even opening the covers. There are few, if any, more accomplished anatomists and physiologists than the distinguished professor of surgery at University College; and he has long enjoyed the highest reputation as a teacher of physiology, possessing remarkable powers of clear exposition and graphic illustration. We have rarely the pleasure of being able to recommend a text-book so unreservedly as this.—*British Med. Journal*, Jan. 25, 1868.

CARPENTER (*WILLIAM B.*), *M. D., F. R. S.*,
Examiner in Physiology and Comparative Anatomy in the University of London.

PRINCIPLES OF HUMAN PHYSIOLOGY; with their chief applications to Psychology, Pathology, Therapeutics, Hygiene and Forensic Medicine.

A new American from the last and revised London edition. With nearly three hundred illustrations. Edited, with additions, by FRANCIS GURNEY SMITH, M. D., Professor of the Institutes of Medicine in the University of Pennsylvania, &c. In one very large and beautiful octavo volume, of about 900 large pages, handsomely printed; extra cloth, $5 50; leather, raised bands, $6 50.

With Dr. Smith, we confidently believe "that the present will more than sustain the enviable reputation already attained by former editions, of being one of the fullest and most complete treatises on the subject in the English language." We know of none from the pages of which a satisfactory knowledge of the physiology of the human organism can be as well obtained, none better adapted for the use of such as take up the study of physiology in its reference to the institutes and practice of medicine.—*Am. Jour. Med. Sciences.*

We doubt not it is destined to retain a strong hold on public favor, and remain the favorite text-book in our colleges.—*Virginia Medical Journal.*

The above is the title of what is emphatically the great work on physiology; and we are conscious that it would be a useless effort to attempt to add anything to the reputation of this invaluable work, and can only say to all with whom our opinion has any influence, that it is our *authority.*—*Atlanta Med. Journal.*

BY *THE SAME AUTHOR.*

PRINCIPLES OF COMPARATIVE PHYSIOLOGY.

New American, from the Fourth and Revised London Edition. In one large and handsome octavo volume, with over three hundred beautiful illustrations. Pp. 752. Extra cloth, $5 00.

As a complete and condensed treatise on its extended and important subject, this work becomes a necessity to students of natural science, while the very low price at which it is offered places it within the reach of all.

KIRKES (*WILLIAM SENHOUSE*), *M. D.*

A MANUAL OF PHYSIOLOGY.

A new American from the third and improved London edition. With two hundred illustrations. In one large and handsome royal 12mo. volume. Pp. 586. Extra cloth, $2 25; leather, $2 75.

It is at once convenient in size, comprehensive in design, and concise in statement, and altogether well adapted for the purpose designed.—*St. Louis Med. and Surg. Journal.*

The physiological reader will find it a most excellent guide in the study of physiology in its most advanced and perfect form. The author has shown himself capable of giving details sufficiently ample in a condensed and concentrated shape, on a science in which it is necessary at once to be correct and not lengthened.—*Edinburgh Med. and Surg. Journal.*

DALTON (J. C.), M. D.,
Professor of Physiology in the College of Physicians and Surgeons, New York, &c.

A TREATISE ON HUMAN PHYSIOLOGY. Designed for the use of Students and Practitioners of Medicine. Fifth edition, revised, with nearly three hundred illustrations on wood. In one very beautiful octavo volume, of over 700 pages, extra cloth, $5 25; leather, $6 25. (*Just Issued.*)

Preface to the Fifth Edition.

In preparing the present edition of this work, the general plan and arrangement of the previous editions have been retained, so far as they have been found useful and adapted to the purposes of a text-book for students of medicine. The incessant advance of all the natural and physical sciences, never more active than within the last five years, has furnished many valuable aids to the special investigations of the physiologist; and the progress of physiological research, during the same period, has required a careful revision of the entire work, and the modification or rearrangement of many of its parts. At this day, nothing is regarded as of any value in natural science which is not based upon direct and intelligible observation or experiment; and, accordingly, the discussion of doubtful or theoretical questions has been avoided, as a general rule, in the present volume, while new facts, from whatever source, if fully established, have been added and incorporated with the results of previous investigation. A number of new illustrations have been introduced, and a few of the older ones, which seemed to be no longer useful, have been omitted. In all the changes and additions thus made, it has been the aim of the writer to make the book, in its present form, a faithful exponent of the actual conditions of physiological science.

NEW YORK, October, 1871.

In this, the standard text-book on Physiology, all that is needed to maintain the favor with which it is regarded by the profession, is the author's assurance that it has been thoroughly revised and brought up to a level with the advanced science of the day. To accomplish this has required some enlargement of the work, but no advance has been made in the price.

A few notices of previous editions are subjoined.

It is no disparagement of the many excellent works on physiology, published prior to that of Dalton, to say that none of them, either in plan of arrangement or clearness of execution, could be compared with his for the use of students or general practitioners of medicine. For this purpose his book has no equal in the English language.—*Western Journal of Medicine*, Nov. 1867.

A capital text-book in every way. We are, therefore, glad to see it in its fourth edition. It has already been examined at full length in these columns, so that we need not now further advert to it beyond remarking that both revision and enlargement have been most judicious.—*London Med. Times and Gazette*, Oct. 19, 1867.

No better proof of the value of this admirable work could be produced than the fact that it has already reached a fourth edition in the short space of eight years. Possessing in an eminent degree the merits of clearness and condensation, and being fully brought up to the present level of Physiology, it is undoubtedly one of the most reliable text-books upon this science that could be placed in the hands of the medical student.—*Am. Journal Med Sciences*, Oct. 1867.

Prof. Dalton's work has such a well-established reputation that it does not stand in need of any recommendation. Ever since its first appearance it has become the highest authority in the English language; and that it is able to maintain the enviable position which it has taken, the rapid exhaustion of the different successive editions is sufficient evidence. The present edition, which is the fourth, has been thoroughly revised, and enlarged by the incorporation of all the many important advances which have lately been made in this rapidly progressing science. —*N. Y. Med. Record*, Oct. 15, 1867.

As it stands, we esteem it the very best of the physiological text-books for the student, and the most concise reference and guide-book for the practitioner. —*N. Y. Med. Journal*, Oct. 1867.

The present edition of this now standard work fully sustains the high reputation of its accomplished author. It is not merely a reprint, but has been faithfully revised, and enriched by such additions as the progress of physiology has rendered desirable. Taken as a whole, it is unquestionably the most reliable and useful treatise on the subject that has been issued from the American press.—*Chicago Med. Journal*, Sept. 1867.

DUNGLISON (ROBLEY), M. D.,
Professor of Institutes of Medicine in Jefferson Medical College, Philadelphia.

HUMAN PHYSIOLOGY. Eighth edition. Thoroughly revised and extensively modified and enlarged, with five hundred and thirty-two illustrations. In tw large and handsomely printed octavo volumes of about 1500 pages, extra cloth. $7 00.

LEHMANN (C. G.).

PHYSIOLOGICAL CHEMISTRY. Translated from the second edition by GEORGE E. DAY, M. D., F. R. S., &c., edited by R. E. ROGERS, M. D., Professor o Chemistry in the Medical Department of the University of Pennsylvania, with illustrations selected from Funke's Atlas of Physiological Chemistry, and an Appendix of plates. Complete in two large and handsome octavo volumes, containing 1200 pages, with nearly two hundred illustrations, extra cloth. $6 00.

BY THE SAME AUTHOR.

MANUAL OF CHEMICAL PHYSIOLOGY. Translated from the German, with Notes and Additions, by J. CHESTON MORRIS, M. D., with an Introductory Essay on Vital Force, by Professor SAMUEL JACKSON, M. D., of the University of Pennsylvania. With illustrations on wood. In one very handsome octavo volume of 336 pages. extra cloth. $2 25.

TODD (ROBERT B.), M.D. F.R.S., and BOWMAN (W.), F.R.S.

THE PHYSIOLOGICAL ANATOMY AND PHYSIOLOGY OF MAN. With about three hundred large and beautiful illustrations on wood. Complete in one large octavo volume of 950 pages, extra cloth. Price $4 75.

ATTFIELD (JOHN), Ph. D.,

Professor of Practical Chemistry to the Pharmaceutical Society of Great Britain, &c.

CHEMISTRY, GENERAL, MEDICAL, AND PHARMACEUTICAL; including the Chemistry of the U. S. Pharmacopœia. A Manual of the General Principles of the Science, and their Application to Medicine and Pharmacy. From the Second and Enlarged English Edition, revised by the author. In one handsome royal 12mo. volume of about 550 pages; extra cloth, $2 75; leather, $3 25. (*Just Issued.*)

It contains a most admirable digest of what is specially needed by the medical student in all that relates to practical chemistry, and constitutes for him a sound and useful text-book on the subject. . . . . We commend it to the notice of every medical, as well as pharmaceutical, student. We only regret that we had not the book to depend upon in working up the subject of practical and pharmaceutical chemistry for the University of London, for which it seems to us that it is exactly adapted. This is paying the book a high compliment.—*The Lancet.*

Dr. Attfield's book is written in a clear and able manner; it is a work *sui generis* and without a rival; it will be welcomed, we think, by every reader of the 'Pharmacopœia,' and is quite as well suited for the medical student as for the pharmacist.—*The Chemical News.*

A valuable guide to practical medical chemistry, and an admirable companion to the "British Pharmacopœia." It is rare to find so many qualities combined, and quite curious to note how much valuable information finds a mutual interdependence.—*Medical Times and Gazette.*

It is almost the only book from which the medical student can work up the pharmacopœial chemistry required at his examinations.—*The Pharmaceutical Journal.*

At page 350 of the current volume of this journal, we remarked that "there is a sad dearth of [medical] students' text-books in chemistry." Dr. Attfield's volume, just published, is rather a new book than a second edition of his previous work, and more nearly realizes our ideal than any book we have before seen on the subject.—*The British Medical Journal.*

The introduction of new matter has not destroyed the original character of the work, as a treatise on pharmaceutical and medical chemistry, but has simply extended the foundations of these special departments of the science.—*The Chemist and Druggist*

We believe that this manual has been already adopted as the class-book by many of the professors in the public schools throughout the United Kingdom. . . . In pharmaceutical chemistry applied to the pharmacopœia, we know of no rival. It is, therefore, particularly suited to the medical student.—*The Medical Press and Circular.*

It in every way fulfils the intention of the author. We can strongly recommend it as a most complete manual of chemistry, alike useful to the physician and pharmaceutist.—*Canada Med. Journ.*, Nov. '70.

ODLING (WILLIAM),

Lecturer on Chemistry, at St. Bartholomew's Hospital, &c.

A COURSE OF PRACTICAL CHEMISTRY, arranged for the Use of Medical Students. With Illustrations. From the Fourth and Revised London Edition. In one neat royal 12mo. volume, extra cloth. $2. (*Lately Issued.*)

As a work for the practitioner it cannot be excelled. It is written plainly and concisely, and gives in a very small compass the information required by the busy practitioner. It is essentially a work for the physician, and no one who purchases it will ever regret the outlay. In addition to all that is usually given in connection with inorganic chemistry, there are most valuable contributions to toxicology, animal and organic chemistry, etc. The portions devoted to a discussion of these subjects are very excellent. In no work can the physician find more that is valuable and reliable in regard to urine, bile, milk, bone, urinary calculi, tissue composition, etc. The work is small, reasonable in price, and well published.—*Richmond and Louisville Med. Journal*, Dec. 1869.

BOWMAN (JOHN E.), M. D.

PRACTICAL HANDBOOK OF MEDICAL CHEMISTRY. Edited by C. L. BLOXAM, Professor of Practical Chemistry in King's College, London. Fifth American, from the fourth and revised English Edition. In one neat volume, royal 12mo., pp. 351, with numerous illustrations, extra cloth. $2 25. (*Just Issued.*)

The fourth edition of this invaluable text-book of Medical Chemistry was published in England in October of the last year. The Editor has brought down the Handbook to that date, introducing, as far as was compatible with the necessary conciseness of such a work, all the valuable discoveries in the science which have come to light since the previous edition was printed. The work is indispensable to every student of medicine or enlightened practitioner. It is printed in clear type, and the illustrations are numerous and intelligible.—*Boston Med. and Surg. Journal.*

BY THE SAME AUTHOR.

INTRODUCTION TO PRACTICAL CHEMISTRY, INCLUDING ANALYSIS. Fifth American, from the fifth and revised London edition. With numerous illustrations. In one neat vol., royal 12mo., extra cloth. $2 25. (*Just Issued.*)

One of the most complete manuals that has for a long time been given to the medical student.—*Athenæum.*

We regard it as realizing almost everything to be desired in an introduction to Practical Chemistry.

It is by far the best adapted for the Chemical student of any that has yet fallen in our way.—*British and Foreign Medico-Chirurgical Review.*

The best introductory work on the subject with which we are acquainted.—*Edinburgh Monthly Jour.*

GRAHAM (THOMAS), F.R.S.

THE ELEMENTS OF INORGANIC CHEMISTRY, including the Applications of the Science in the Arts. New and much enlarged edition, by HENRY WATTS and ROBERT BRIDGES, M. D. Complete in one large and handsome octavo volume, of over 800 very large pages, with two hundred and thirty-two wood-cuts, extra cloth. $5 50.

KNAPP'S TECHNOLOGY; or Chemistry Applied to the Arts, and to Manufactures. With American additions, by Prof. WALTER R. JOHNSON. In two very handsome octavo volumes, with 500 wood engravings, extra cloth, $6 00.

FOWNES (GEORGE), Ph. D.

A MANUAL OF ELEMENTARY CHEMISTRY; Theoretical and Practical.

With one hundred and ninety-seven illustrations. A new American, from the tenth and revised London edition. Edited by ROBERT BRIDGES, M. D. In one large royal 12mo. volume, of about 850 pp., extra cloth, $2 75; leather, $3 25. (*Just Issued.*)

Some years having elapsed since the appearance of the last American edition, and several revisions having been made of the work in England during the interval, it will be found very greatly altered, and enlarged by about two hundred and fifty pages, containing nearly one half more matter than before. The editors, Mr. Watts and Dr. Bence Jones, have labored sedulously to render it worthy in all respects of the very remarkable favor which it has thus far enjoyed, by incorporating in it all the most recent investigations and discoveries, in so far as is compatible with its design as an elementary text-book. While its distinguishing characteristics have been preserved, various portions have been rewritten, and especial pains have been taken with the department of Organic Chemistry in which late researches have accumulated so many new facts and have enabled the subject to be systematized and rendered intelligible in a manner formerly impossible. As only a few months have elapsed since the work thus passed through the hands of Mr. Watts and Dr. Bence Jones, but little has remained to be done by the American editor. Such additions as seemed advisable have however been made, and especial care has been taken to secure, by the closest scrutiny, the accuracy so essential in a work of this nature.

Thus fully brought up to a level with the latest advances of science, and presented at a price within the reach of all, it is hoped that the work will maintain its position as the favorite text-book of the medical student.

This work is so well known that it seems almost superfluous for us to speak about it. It has been a favorite text-book with medical students for years, and its popularity has in no respect diminished. Whenever we have been consulted by medical students, as has frequently occurred, what treatise on chemistry they should procure, we have always recommended Fownes', for we regarded it as the best. There is no work that combines so many excellences. It is of convenient size, not prolix, of plain perspicuous diction, contains all the most recent discoveries, and is of moderate price.—*Cincinnati Med. Repertory*, Aug. 1569.

Large additions have been made, especially in the department of organic chemistry, and we know of no other work that has greater claims on the physician, pharmaceutist, or student, than this. We cheerfully recommend it as the best text-book on elementary chemistry, and bespeak for it the careful attention of students of pharmacy.—*Chicago Pharmacist*, Aug. 1869.

The American reprint of the tenth revised and corrected English edition is now issued, and represents the present condition of the science. No comments are necessary to insure it a favorable reception at the hands of practitioners and students.—*Boston Med. and Surg. Journal*, Aug. 12, 1569.

It will continue, as heretofore, to hold the first rank as a text-book for students of medicine.—*Chicago Med. Examiner*, Aug. 1869.

This work, long the recognized Manual of Chemistry, appears as a tenth edition, under the able editorship of Bence Jones and Henry Watts. The chapter on the General Principles of Chemical Philosophy, and the greater part of the organic chemistry, have been rewritten, and the whole work revised in accordance with the recent advances in chemical knowledge. It remains the standard text-book of chemistry.—*Dublin Quarterly Journal*, Feb. 1869.

There is probably not a student of chemistry in this country to whom the admirable manual of the late Professor Fownes is unknown. It has achieved a success which we believe is entirely without a parallel among scientific text-books in our language. This success has arisen from the fact that there is no English work on chemistry which combines so many excellences. Of convenient size, of attractive form, clear and concise in diction, well illustrated, and of moderate price, it would seem that every requisite for a student's hand-book has been attained. The ninth edition was published under the joint editorship of Dr. Bence Jones and Dr. Hofmann; the new one has been superintended through the press by Dr. Bence Jones and Mr. Henry Watts. It is not too much to say that it could not possibly have been in better hands. There is no one in England who can compare with Mr. Watts in experience as a compiler in chemical literature, and we have much pleasure in recording the fact that his reputation is well sustained by this, his last undertaking.—*The Chemical News*, Feb. 1869.

Here is a new edition which has been long watched for by eager teachers of chemistry. In its new garb, and under the editorship of Mr. Watts, it has resumed its old place as the most successful of text-books.—*Indian Medical Gazette*, Jan. 1, 1869.

BRANDE (WM. T.), D.C.L., and TAYLOR (ALFRED S.), M.D., F.R.S.

CHEMISTRY. Second American edition, thoroughly revised by Dr. TAYLOR.

In one handsome 8vo. volume of 764 pages, extra cloth, $5 00; leather, $6 00.

FROM DR. TAYLOR'S PREFACE.

"The revision of the second edition, in consequence of the death of my lamented colleague, has devolved entirely upon myself. Every chapter, and indeed every page, has been revised, and numerous additions made in all parts of the volume. These additions have been restricted chiefly to subjects having some practical interest, and they have been made as concise as possible, in order to keep the book within those limits which may retain for it the character of a Student's Manual"—*London*, June 29, 1867.

A book that has already so established a reputation, as has Brande and Taylor's Chemistry, can hardly need a notice, save to mention the additions and improvements of the edition. Doubtless the work will long remain a favorite text-book in the schools, as well as a convenient book of reference for all.—*N. Y. Medical Gazette*, Oct. 12, 1867.

For this reason we hail with delight the republication, in a form which will meet with general approval and command public attention, of this really valuable standard work on chemistry—more particularly as it has been adapted with such care to the wants of the general public. The well known scholarship of its authors, and their extensive researches for many years in experimental chemistry, have been long appreciated in the scientific world, but in this work they have been careful to give the largest possible amount of information with the most sparing use of technical terms and phraseology, so as to furnish the reader, "whether a student of medicine, or a man of the world, with a plain introduction to the science and practice of chemistry."—*Journal of Applied Chemistry*, Oct. 1867.

This second American edition of an excellent treatise on chemical science is not a mere republication from the English press, but is a revision and enlargement of the original, under the supervision of the surviving author, Dr. Taylor. The favorable opinion expressed on the publication of the former edition of this work is fully sustained by the present revision, in which Dr. T. has increased the size of the volume, by an addition of sixty-eight pages.—*Am. Journ. Med. Sciences*, Oct. 1567.

PARRISH (EDWARD),

Professor of Materia Medica in the Philadelphia College of Pharmacy.

A TREATISE ON PHARMACY. Designed as a Text-Book for the Student, and as a Guide for the Physician and Pharmaceutist. With many Formulæ and Prescriptions. Third Edition, greatly improved. In one handsome octavo volume, of 850 pages, with several hundred illustrations, extra cloth. $5 00; leather, $6 00.

The immense amount of practical information condensed in this volume may be estimated from the fact that the Index contains about 4700 items. Under the head of Acids there are 312 references; under Emplastrum, 36; Extracts, 159; Lozenges, 25; Mixtures, 55; Pills, 56; Syrups, 131; Tinctures, 138; Unguentum, 57, &c.

We have examined this large volume with a good deal of care, and find that the author has completely exhausted the subject upon which he treats; a more complete work, we think, it would be impossible to find. To the student of pharmacy the work is indispensable; indeed, so far as we know, it is the only one of its kind in existence, and even to the physician or medical student who can spare five dollars to purchase it, we feel sure the practical information he will obtain will more than compensate him for the outlay.—*Canada Med. Journal*, Nov. 1864.

The medical student and the practising physician will find the volume of inestimable worth for study and reference.—*San Francisco Med. Press*, July, 1864.

When we say that this book is in some respects the best which has been published on the subject in the English language for a great many years, we do not wish it to be understood as very extravagant praise. In truth, it is not so much the best as the only book.—*The London Chemical News.*

An attempt to furnish anything like an analysis of Parrish's very valuable and elaborate *Treatise on Practical Pharmacy* would require more space than we have at our disposal. This, however, is not so much a matter of regret, inasmuch as it would be difficult to think of any point, however minute and apparently trivial, connected with the manipulation of pharmaceutic substances or appliances which has not been clearly and carefully discussed in this volume. Want of space prevents our enlarging further on this valuable work, and we must conclude by a simple expression of our hearty appreciation of its merits.—*Dublin Quarterly Jour. of Medical Science*, August, 1864.

STILLÉ (ALFRED), M.D.,

Professor of Theory and Practice of Medicine in the University of Penna.

THERAPEUTICS AND MATERIA MEDICA; a Systematic Treatise on the Action and Uses of Medicinal Agents, including their Description and History. Third edition, revised and enlarged. In two large and handsome octavo volumes of about 1700 pages, extra cloth, $10; leather, $12.

Dr. Stillé's splendid work on therapeutics and materia medica.—*London Med. Times*, April 8, 1865.

Dr. Stillé stands to-day one of the best and most honored representatives at home and abroad, of American medicine; and these volumes, a library in themselves, a treasure-house for every studious physician, assure his fame even had he done nothing more.—*The Western Journal of Medicine*, Dec. 1868.

We regard this work as the best one on Materia Medica in the English language, and as such it deserves the favor it has received.—*Am. Journ. Medical Sciences*, July 1868.

We need not dwell on the merits of the third edition of this magnificently conceived work. It is the work on Materia Medica, in which Therapeutics are primarily considered—the mere natural history of drugs being briefly disposed of. To medical practitioners this is a very valuable conception. It is wonderful how much of the riches of the literature of Materia Medica has been condensed into this book. The references alone would make it worth possessing. But it is not a mere compilation. The writer exercises a good judgment of his own on the great doctrines and points of Therapeutics. For purposes of practice, Stillé's book is almost unique as a repertory of information, empirical and scientific, on the actions and uses of medicines.—*London Lancet*, Oct. 31, 1868.

Through the former editions, the professional world is well acquainted with this work. At home and abroad its reputation as a standard treatise on Materia Medica is securely established. It is second to no work on the subject in the English tongue, and, indeed, is decidedly superior, in some respects, to any other.—*Pacific Med. and Surg. Journal*, July, 1868.

Stillé's Therapeutics is incomparably the best work on the subject.—*N. Y. Med. Gazette*, Sept. 26, 1868.

Dr. Stillé's work is becoming the best known of any of our treatises on Materia Medica. . . . One of the most valuable works in the language on the subjects of which it treats.—*N. Y. Med. Journal*, Oct. 1868.

The rapid exhaustion of two editions of Prof. Stillé's scholarly work, and the consequent necessity for a third edition, is sufficient evidence of the high estimate placed upon it by the profession. It is no exaggeration to say that there is no superior work upon the subject in the English language. The present edition is fully up to the most recent advances in the science and art of therapeutics.—*Leavenworth Medical Herald*, Aug. 1868.

The work of Prof. Stillé has rapidly taken a high place in professional esteem, and to say that a third edition is demanded and now appears before us, sufficiently attests the firm position this treatise has made for itself. As a work of great research, and scholarship, it is safe to say we have nothing superior. It is exceedingly full, and the busy practitioner will find ample suggestions upon almost every important point of therapeutics.—*Cincinnati Lancet*, Aug. 1868.

GRIFFITH (ROBERT E.), M.D.

A UNIVERSAL FORMULARY, Containing the Methods of Preparing and Administering Officinal and other Medicines. The whole adapted to Physicians and Pharmaceutists. Second edition, thoroughly revised, with numerous additions, by ROBERT P. THOMAS, M.D., Professor of Materia Medica in the Philadelphia College of Pharmacy. In one large and handsome octavo volume of 650 pages, double-columns. Extra cloth, $4 00; leather, $5 00.

Three complete and extended Indexes render the work especially adapted for immediate consultation. One, of DISEASES AND THEIR REMEDIES, presents under the head of each disease the remedial agents which have been usefully exhibited in it, with reference to the formulæ containing them—while another of PHARMACEUTICAL and BOTANICAL NAMES, and a very thorough GENERAL INDEX afford the means of obtaining at once any information desired. The Formulary itself is arranged alphabetically, under the heads of the leading constituents of the prescriptions.

We know of none in our language, or any other, so comprehensive in its details.—*London Lancet.*

One of the most complete works of the kind in any language.—*Edinburgh Med. Journal.*

We are not cognizant of the existence of a parallel work.—*London Med. Gazette.*

PEREIRA (JONATHAN), M.D., F.R.S. and L.S.

MATERIA MEDICA AND THERAPEUTICS; being an Abridgment of the late Dr. Pereira's Elements of Materia Medica, arranged in conformity with the British Pharmacopœia, and adapted to the use of Medical Practitioners, Chemists and Druggists, Medical and Pharmaceutical Students, &c.

By F. J. FARRE, M.D., Senior Physician to St. Bartholomew's Hospital, and London Editor of the British Pharmacopœia; assisted by ROBERT BENTLEY, M.R.C.S., Professor of Materia Medica and Botany to the Pharmaceutical Society of Great Britain; and by ROBERT WARINGTON, F.R.S., Chemical Operator to the Society of Apothecaries. With numerous additions and references to the United States Pharmacopœia, by HORATIO C. WOOD, M.D., Professor of Botany in the University of Pennsylvania. In one large and handsome octavo volume of 1040 closely printed pages, with 236 illustrations, extra cloth, $7 00; leather, raised bands, $8 00.

The task of the American editor has evidently been no sinecure, for not only has he given to us all that is contained in the abridgment useful for our purposes, but by a careful and judicious embodiment of over a hundred new remedies has increased the size of the former work fully one-third, besides adding many new illustrations, some of which are original. We unhesitatingly say that by so doing he has proportionately increased the value, not only of the condensed edition, but has extended the applicability of the great original, and has placed his medical countrymen under lasting obligations to him. The American physician now has all that is needed in the shape of a complete treatise on materia medica, and the medical student has a text-book which, for practical utility and intrinsic worth, stands unparalleled. Although of considerable size, it is none too large for the purposes for which it has been intended, and every medical man should, in justice to himself, spare a place for it upon his book-shelf, resting assured that the more he consults it the better he will be satisfied of its excellence.—*N. Y. Med. Record*, Nov. 15, 1866.

It will fill a place which no other work can occupy in the library of the physician, student, and apothecary.—*Boston Med. and Surg. Journal*, Nov. 8, 1866.

Of the many works on Materia Medica which have appeared since the issuing of the British Pharmacopœia, none will be more acceptable to the student and practitioner than the present. Pereira's Materia Medica had long ago asserted for itself the position of being the most complete work on the subject in the English language. But its very completeness stood in the way of its success. Except in the way of reference, or to those who made a special study of Materia Medica, Dr. Pereira's work was too full, and its perusal required an amount of time which few had at their disposal. Dr. Farre has very judiciously availed himself of the opportunity of the publication of the new Pharmacopœia, by bringing out an abridged edition of the great work. This edition of Pereira is by no means a mere abridged re-issue, but contains many improvements, both in the descriptive and therapeutical departments. We can recommend it as a very excellent and reliable text-book.—*Edinburgh Med. Journal*, February, 1866.

The reader cannot fail to be impressed, at a glance, with the exceeding value of this work as a compend of nearly all useful knowledge on the materia medica. We are greatly indebted to Professor Wood for his adaptation of it to our meridian. Without his emendations and additions it would lose much of its value to the American student. With them it is an American book.—*Pacific Medical and Surgical Journal*, December, 1866.

ELLIS (BENJAMIN), M.D.

THE MEDICAL FORMULARY: being a Collection of Prescriptions

derived from the writings and practice of many of the most eminent physicians of America and Europe. Together with the usual Dietetic Preparations and Antidotes for Poisons. The whole accompanied with a few brief Pharmaceutic and Medical Observations. Twelfth edition, carefully revised and much improved by ALBERT H. SMITH, M. D. In one volume 8vo. of 376 pages, extra cloth, $3 00. (*Lately Published.*)

This work has remained for some time out of print, owing to the anxious care with which the Editor has sought to render the present edition worthy a continuance of the very remarkable favor which has carried the volume to the unusual honor of a TWELFTH EDITION. He has sedulously endeavored to introduce in it all new preparations and combinations deserving of confidence, besides adding two new classes, Antemetics and Disinfectants, with brief references to the inhalation of atomized fluids, the nasal douche of Thudichum, suggestions upon the method of hypodermic injection, the administration of anæsthetics, &c. &c. To accommodate these numerous additions, he has omitted much which the advance of science has rendered obsolete or of minor importance, notwithstanding which the volume has been increased by more than thirty pages. A new feature will be found in a copious Index of Diseases and their remedies, which cannot but increase the value of the work as a suggestive book of reference for the working practitioner. Every precaution has been taken to secure the typographical accuracy so necessary in a work of this nature, and it is hoped that the new edition will fully maintain the position which "ELLIS' FORMULARY" has long occupied.

CARSON (JOSEPH), M.D.,

Professor of Materia Medica and Pharmacy in the University of Pennsylvania, &c.

SYNOPSIS OF THE COURSE OF LECTURES ON MATERIA MEDICA AND PHARMACY,

delivered in the University of Pennsylvania. With three Lectures on the Modus Operandi of Medicines. Fourth and revised edition, extra cloth, $3 00.

DUNGLISON'S NEW REMEDIES, WITH FORMULÆ FOR THEIR PREPARATION AND ADMINISTRATION. Seventh edition, with extensive additions. One vol. 8vo., pp. 770; extra cloth. $4 00.

ROYLE'S MATERIA MEDICA AND THERAPEUTICS. Edited by JOSEPH CARSON, M. D. With ninety-eight illustrations. 1 vol. 8vo., pp. 700, extra cloth. $3 00.

CHRISTISON'S DISPENSATORY. With copious additions, and 213 large wood-engravings. By R EGLESFELD GRIFFITH, M. D. One vol. 8vo., pp. 1000; extra cloth. $4 00.

CARPENTER'S PRIZE ESSAY ON THE USE OF ALCOHOLIC LIQUORS IN HEALTH AND DISEASE. New edition, with a Preface by D. F. CONDIE, M. D., and explanations of scientific words. In one neat 12mo. volume, pp. 178, extra cloth. 60 cents.

DE JONGH ON THE THREE KINDS OF COD-LIVER OIL, with their Chemical and Therapeutic Properties. 1 vol. 12mo., cloth. 75 cents.

GREEN (T. HENRY), M.D.,

Lecturer on Pathology and Morbid Anatomy at Charing-Cross Hospital Medical School.

PATHOLOGY AND MORBID ANATOMY. With numerous Illustrations on Wood. In one very handsome octavo volume of over 250 pages, extra cloth, $2 50. (*Just Issued.*)

The scope and object of this volume can be gathered from the following condensed

SUMMARY OF CONTENTS.

Introduction. Chapter I. The "Cell." II. Nutrition Arrested. III. Nutrition Impaired. IV. Fatty Degeneration. V. Mucoid and Colloid Degeneration. VI. Fatty Infiltration. VII. Amyloid Degeneration. VIII. Calcareous Degeneration. IX. Pigmentary Degeneration. X. Nutrition Increased. XI. New Formations. XII. The Fibromata. XIII. The Sarcomata. XIV. The Gummata. XV. The Myxomata. XVI. The Lipomata. XVII. The Enchondromata. XVIII. The Osteomata. XIX. The Lymphomata. XX. Tubercle. XXI. The Papillomata. XXII. The Adenomata. XXIII. The Carcinomata. XXIV. The Myomata, Neuromata, and Angeomata. XXV. Cysts. XXVI. Inflammation. XXVII. Inflammation of Non-Vascular Tissues. XXVIII. Inflammation of Vascular Connective Tissues. XXIX. Inflammation of Bloodvessels and Heart. XXX. Inflammation of Lymphatic Structures. XXXI. Inflammation of Mucous Membranes. XXXII. Inflammation of Serous Membranes. XXXIII. Inflammation of the Liver. XXXIV. Inflammation of the Kidney. XXXV. Inflammation of the Lungs. XXXVI. Inflammation of Brain and Spinal Cord. XXXVII. Changes in the Blood and Circulation. XXXVIII. Thrombosis. XXXIX. Embolism.

We have been very much pleased by our perusal of this little volume. It is the only one of the kind with which we are acquainted, and practitioners as well as students will find it a very useful guide; for the information is up to the day, well and compactly arranged, without being at all scanty.—*London Lancet*, Oct. 7, 1871.

GROSS (SAMUEL D.), M. D.,

Professor of Surgery in the Jefferson Medical College of Philadelphia.

ELEMENTS OF PATHOLOGICAL ANATOMY. Third edition, thoroughly revised and greatly improved. In one large and very handsome octavo volume of nearly 800 pages, with about three hundred and fifty beautiful illustrations, of which a large number are from original drawings; extra cloth. $4 00.

JONES (C. HANDFIELD), F.R.S., and SIEVEKING (ED. H.), M.D.,

Assistant Physicians and Lecturers in St. Mary's Hospital.

A MANUAL OF PATHOLOGICAL ANATOMY. First American edition, revised. With three hundred and ninety-seven handsome wood engravings. In one large and beautifully printed octavo volume of nearly 750 pages, extra cloth, $3 50.

BARCLAY (A. W.), M. D.

A MANUAL OF MEDICAL DIAGNOSIS; being an Analysis of the Signs and Symptoms of Disease. Third American from the second and revised London edition. In one neat octavo volume of 451 pages, extra cloth. $3 50.

WILLIAMS (CHARLES J. B.), M.D.,

Professor of Clinical Medicine in University College, London.

PRINCIPLES OF MEDICINE. An Elementary View of the Causes, Nature, Treatment, Diagnosis, and Prognosis of Disease; with brief remarks on Hygienics, or the preservation of health. A new American, from the third and revised London edition. In one octavo volume of about 500 pages, extra cloth. $3 50.

GLUGE'S ATLAS OF PATHOLOGICAL HISTOLOGY. Translated, with Notes and Additions, by JOSEPH LEIDY, M. D. In one volume, very large imperial quarto, with 320 copper-plate figures, plain and colored, extra cloth. $4 00.

SIMON'S GENERAL PATHOLOGY, as conducive to the Establishment of Rational Principles for the Prevention and Cure of Disease. In one octavo volume of 212 pages, extra cloth. $1 25.

SOLLY ON THE HUMAN BRAIN; its Structure, Physiology, and Diseases. From the Second and much enlarged London edition. In one octavo volume 500 pages, with 120 wood-cuts; extra cloth. $2 50.

LA ROCHE ON YELLOW FEVER, considered in its Historical, Pathological, Etiological, and Therapeutical Relations. In two large and handsome octavo volumes, of nearly 1500 pages, extra cloth, $7 00.

HOLLAND'S MEDICAL NOTES AND REFLECTIONS. 1 vol. 8vo., pp. 500, extra cloth. $3 50.

WHAT TO OBSERVE AT THE BEDSIDE AND AFTER DEATH IN MEDICAL CASES. Published under the authority of the London Society for Medical Observation. From the second London edition. 1 vol. royal 12mo., extra cloth. $1 00.

LAYCOCK'S LECTURES ON THE PRINCIPLES AND METHODS OF MEDICAL OBSERVATION AND RESEARCH. For the use of advanced students and junior practitioners. In one very neat royal 12mo. volume, extra cloth. $1 00.

DUNGLISON, FORBES, TWEEDIE, AND CONOLLY.

THE CYCLOPÆDIA OF PRACTICAL MEDICINE: comprising Treatises on the Nature and Treatment of Diseases, Materia Medica and Therapeutics, Diseases of Women and Children, Medical Jurisprudence, &c. &c. In four large super-royal octavo volumes, of 3254 double-columned pages, strongly and handsomely bound in leather, $15; extra cloth, $11.

⁂ This work contains no less than four hundred and eighteen distinct treatises, contributed by sixty-eight distinguished physicians.

FLINT (AUSTIN), M. D.,

Professor of the Principles and Practice of Medicine in Bellevue Med. College, N. Y.

A TREATISE ON THE PRINCIPLES AND PRACTICE OF

MEDICINE; designed for the use of Students and Practitioners of Medicine. Third edition, revised and enlarged. In one large and closely printed octavo volume of 1002 pages; handsome extra cloth, $6 00; or strongly bound in leather, with raised bands, $7 00. (*Lately Published.*)

By common consent of the English and American medical press, this work has been assigned to the highest position as a complete and compendious text-book on the most advanced condition of medical science. At the very moderate price at which it is offered it will be found one of the cheapest volumes now before the profession.

Admirable and unequalled.—*Western Journal of Medicine*, Nov. 1869.

Dr. Flint's work, though claiming no higher title than that of a text-book, is really more. He is a man of large clinical experience, and his book is full of such masterly descriptions of disease as can only be drawn by a man intimately acquainted with their various forms. It is not so long since we had the pleasure of reviewing his first edition, and we recognise a great improvement, especially in the general part of the work. It is a work which we can cordially recommend to our readers as fully abreast of the science of the day.—*Edinburgh Med. Journal*, Oct. '69.

One of the best works of the kind for the practitioner, and the most convenient of all for the student.—*Am. Journ. Med. Sciences*, Jan. 1869.

This work, which stands pre-eminently as the advance standard of medical science up to the present time in the practice of medicine, has for its author one who is well and widely known as one of the leading practitioners of this continent. In fact, it is seldom that any work is ever issued from the press more deserving of universal recommendation.—*Dominion Med. Journal*, May, 1869.

The third edition of this most excellent book scarcely needs any commendation from us. The volume, as it stands now, is really a marvel: first of all, it is excellently printed and bound—and we encounter that luxury of America, the ready-cut pages, which the Yankees are 'cute enough to insist upon—nor are these by any means trifles; but the contents of the book are astonishing. Not only is it wonderful that any one man can have grasped in his mind the whole scope of medicine with that vigor which Dr Flint shows, but the condensed yet clear way in which this is done is a perfect literary triumph Dr. Flint is pre-eminently one of the strong men, whose right to do this kind of thing is well admitted; and we say no more than the truth when we affirm that he is very nearly the only living man that could do it with such results as the volume before us.—*The London Practitioner*, March, 1869.

This is in some respects the best text-book of medicine in our language, and it is highly appreciated on the other side of the Atlantic, inasmuch as the first edition was exhausted in a few months. The second edition was little more than a reprint, but the present has, as the author says, been thoroughly revised. Much valuable matter has been added, and by making the type smaller, the bulk of the volume is not much increased. The weak point in many American works is pathology, but Dr. Flint has taken peculiar pains on this point, greatly to the value of the book.—*London Med. Times and Gazette*, Feb. 6, 1869.

Published in 1866, this valuable book of Dr. Flint's has in two years exhausted two editions, and now we gladly announce a third. We say we gladly announce it, because we are proud of it as a national representative work of not only American, but of cosmopolitan medicine. In it the practice of medicine is young and philosophical, based on reason and common sense, and as such, we hope it will be at the right hand of every practitioner of this vast continent.—*California Medical Gazette*, March, 1869.

Considering the large number of valuable works in the practice of medicine, already before the profession, the marked favor with which this has been received, necessitating a third edition in the short space of two years, indicates unmistakably that it is a work of more than ordinary excellence, and must be accepted as evidence that it has largely fulfilled the object for which the author intended it. A marked feature in the work, and one which particularly adapts it for the use of students as a text-book, and certainly renders it none the less valuable to the busy practitioner as a work of reference, is brevity and simplicity The present edition has been thoroughly revised, and much new matter incorporated, derived, as the author informs us, both from his own clinical studies, and from the latest contributions to medical literature, thus bringing it fully up with the most recent advances of the science, and greatly enhancing its practical utility; while, by a slight modification of its typographical arrangement, the additions have been accommodated without materially increasing its bulk.—*St. Louis Med. Archives*, Feb. 1869.

If there be among our readers any who are not familiar with the treatise before us, we shall do them a service in persuading them to repair their omission forthwith. Combining to a rare degree the highest scientific attainments with the most practical common sense, and the closest habits of observation, the author has given us a volume which not only sets forth the results of the latest investigations of other laborers, but contains more original views than any other single work upon this well-worn theme within our knowledge.—*N. Y. Med. Gazette*, Feb. 27, 1869.

BARLOW'S MANUAL OF THE PRACTICE OF MEDICINE. With Additions by D. F. CONDIE, M D. 1 vol. 8vo., pp. 600, cloth. $2 50.

TODD'S CLINICAL LECTURES ON CERTAIN ACUTE DISEASES. In one neat octavo volume, of 320 pages, extra cloth. $2 50.

PAVY (F. W.), M. D., F. R. S.,

Senior Asst. Physician to and Lecturer on Physiology, at Guy's Hospital, &c.

A TREATISE ON THE FUNCTION OF DIGESTION; its Disorders and their Treatment.

From the second London edition. In one handsome volume, small octavo, extra cloth, $2 00. (*Lately Published.*)

The work before us is one which deserves a wide circulation. We know of no better guide to the study of digestion and its disorders.—*St. Louis Med. and Surg. Journal*, July 10, 1869.

A thoroughly good book, being a careful systematic treatise, and sufficiently exhaustive for all practical purposes.—*Leavenworth Med. Herald*, July, 1869.

A very valuable work on the subject of which it treats. Small, yet it is full of valuable information.—*Cincinnati Med. Repertory*, June, 1869.

BRINTON (WILLIAM), M. D., F. R. S.

LECTURES ON THE DISEASES OF THE STOMACH; with an

Introduction on its Anatomy and Physiology. From the second and enlarged London edition. With illustrations on wood. In one handsome octavo volume of about 300 pages, extra cloth. $3 25.

HARTSHORNE (HENRY), M.D.,
Professor of Hygiene in the University of Pennsylvania.

ESSENTIALS OF THE PRINCIPLES AND PRACTICE OF MEDICINE.

A handy-book for Students and Practitioners. Third edition, revised and improved. In one handsome royal 12mo. volume of 487 pages, clearly printed on small type, cloth, $2 38; half bound, $2 63. (*Now Ready.*)

The very remarkable favor which has been bestowed upon this work, as manifested in the exhaustion of two large editions within four years, shows that it has successfully supplied a want felt by both student and practitioner of a volume which at a moderate price and in a convenient size should afford a clear and compact view of the most modern teachings in medical practice. In preparing the work for a third edition, the author has sought to maintain its character by very numerous additions, bringing it fully up to the science of the day, but so concisely framed that the size of the volume is increased only by thirty or forty pages. The extent of the new information thus introduced may be estimated by the fact that there have been two hundred and sixty separate additions made to the text, containing references to one hundred and eighty new authors.

This little epitome of medical knowledge has already been noticed by us. It is a vade mecum of value, including in a short space most of what is essential in the science and practice of medicine. The third edition is well up to the present day in the modern methods of treatment, and in the use of newly discovered drugs.—*Boston Med. and Surg. Journal*, Oct. 19, 1871.

Certainly very few volumes contain so much precise information within so small a compass.—*N. Y. Med. Journal*, Nov. 1871.

The diseases are conveniently classified; symptoms, causation, diagnosis, prognosis, and treatment are carefully considered, the whole being marked by briefness, but clearness of expression. Over 250 formulas are appended, intended as examples merely, not as guides, for unthinking practitioners. A complete index facilitates the use of this little volume, in which all important remedies lately introduced, such as chloral hydrate and carbolic acid, have received their full share of attention.—*Am. Journ. of Pharm.*, Nov. 1871.

It is an epitome of the whole science and practice of medicine, and will be found most valuable to the practitioner for easy reference, and especially to the student in attendance upon lectures, whose time is too much occupied with many studies, to consult the larger works. Such a work must always be in great demand.—*Cincinnati Med. Repertory*, Nov. 1871.

WATSON (THOMAS), M. D., &c.

LECTURES ON THE PRINCIPLES AND PRACTICE OF PHYSIC.

Delivered at King's College, London. A new American, from the Fifth revised and enlarged English edition. Edited, with additions, and several hundred illustrations, by HENRY HARTSHORNE, M.D., Professor of Hygiene in the University of Pennsylvania. In two large and handsome octavo volumes. (*Shortly.*)

With the assistance of Professor George Johnson, his successor in the chair of Practice of Medicine in King's College, the author has thoroughly revised this work, and has sought to bring it on a level with the most advanced condition of the subject. As he himself remarks: "Considering the rapid advance of medical science during the last fourteen years, the present edition would be worthless, if it did not differ much from the last"—but in the extensive alterations and additions that have been introduced, the effort of the author has been to retain the lucid and colloquial style of the lecture-room, which has made the work so deservedly popular with all classes of the profession. Notwithstanding these changes, there are some subjects on which the American reader might reasonably expect more detailed information than has been thought requisite in England, and these deficiencies the editor has endeavored to supply.

The large size to which the work has grown seems to render it necessary to print it in two volumes, in place of one, as in the last American edition. It is therefore presented in that shape, handsomely printed, at a very reasonable price, and it is hoped that it will fully maintain the position everywhere hitherto accorded to it, of the standard and classical representative of English practical medicine.

At length, after many months of expectation, we have the satisfaction of finding ourselves this week in possession of a revised and enlarged edition of Sir Thomas Watson's celebrated Lectures. It is a subject for congratulation and for thankfulness that Sir Thomas Watson, during a period of comparative leisure, after a long, laborious, and most honorable professional career, while retaining full possession of his high mental faculties, should have employed the opportunity to submit his Lectures to a more thorough revision than was possible during the earlier and busier period of his life. Carefully passing in review some of the most intricate and important pathological and practical questions, the results of his clear insight and his calm judgment are now recorded for the benefit of mankind, in language which, for precision, vigor, and classical elegance, has rarely been equalled, and never surpassed. The revision has evidently been most carefully done, and the results appear in almost every page.—*Brit. Med. Journ.*, Oct. 14, 1871.

CHAMBERS (T. K.), M. D.,
Consulting Physician to St. Mary's Hospital, London, &c.

THE INDIGESTIONS; or, Diseases of the Digestive Organs Functionally Treated.

Third and revised Edition. In one handsome octavo volume of 393 pages, extra cloth. $3 00. (*Lately Published.*)

So very large a proportion of the patients applying to every general practitioner suffer from some form of indigestion, that whatever aids him in their management directly "puts money in his purse," and indirectly does more than anything else to advance his reputation with the public. From this purely material point of view, setting aside its higher claims to merit, we know of no more desirable acquisition to a physician's library than the book before us. He who should commit its contents to his memory would find its price an investment of capital that returned him a most usurious rate of interest.—*N. Y. Medical Gazette*, Jan 28, 1871.

BY THE SAME AUTHOR. (*Just Issued.*)

RESTORATIVE MEDICINE.

An Harveian Annual Oration, delivered at the Royal College of Physicians, London, on June 24, 1871. With Two Sequels. In one very handsome volume, small 12mo., extra cloth, $1 00.

FLINT (AUSTIN), M. D.,

Professor of the Principles and Practice of Medicine in Bellevue Hospital Med. College, N. Y.

A PRACTICAL TREATISE ON THE DIAGNOSIS, PATHOLOGY, AND TREATMENT OF DISEASES OF THE HEART.

Second revised and enlarged edition. In one octavo volume of 550 pages, with a plate, extra cloth, $4. (*Just Issued.*)

The author has sedulously improved the opportunity afforded him of revising this work. Portions of it have been rewritten, and the whole brought up to a level with the most advanced condition of science. It must therefore continue to maintain its position as the standard treatise on the subject.

Dr. Flint chose a difficult subject for his researches, and has shown remarkable powers of observation and reflection, as well as great industry, in his treatment of it. His book must be considered the fullest and clearest practical treatise on those subjects, and should be in the hands of all practitioners and students. It is a credit to American medical literature. —*Amer. Journ. of the Med. Sciences*, July, 1860.

We question the fact of any recent American author in our profession being more extensively known, or more deservedly esteemed in this country than Dr. Flint. We willingly acknowledge his success, more particularly in the volume on diseases of the heart, in making an extended personal clinical study available for purposes of illustration, in connection with cases which have been reported by other trustworthy observers.—*Brit. and For. Med.-Chirurg. Review.*

In regard to the merits of the work, we have no hesitation in pronouncing it full, accurate, and judicious. Considering the present state of science, such a work was much needed. It should be in the hands of every practitioner.—*Chicago Med. Journ.*

With more than pleasure do we hail the advent of this work, for it fills a wide gap on the list of text-books for our schools, and is, for the practitioner, the most valuable practical work of its kind.—*N. O. Med. News.*

BY THE SAME AUTHOR.

A PRACTICAL TREATISE ON THE PHYSICAL EXPLORATION OF THE CHEST AND THE DIAGNOSIS OF DISEASES AFFECTING THE RESPIRATORY ORGANS.

Second and revised edition. In one handsome octavo volume of 595 pages, extra cloth, $4 50.

Dr. Flint's treatise is one of the most trustworthy guides which he can consult. The style is clear and distinct, and is also concise, being free from that tendency to over-refinement and unnecessary minuteness which characterizes many works on the same subject.—*Dublin Medical Press*, Feb. 6, 1867.

The chapter on Phthisis is replete with interest; and his remarks on the diagnosis, especially in the early stages, are remarkable for their acumen and great practical value. Dr. Flint's style is clear and elegant, and the tone of freshness and originality which pervades his whole work lend an additional force to its thoroughly practical character, which cannot fail to obtain for it a place as a standard work on diseases of the respiratory system.—*London Lancet*, Jan. 19, 1867.

This is an admirable book. Excellent in detail and execution, nothing better could be desired by the practitioner. Dr. Flint enriches his subject with much solid and not a little original observation.—*Ranking's Abstract*, Jan. 1867.

FULLER (HENRY WILLIAM), M. D.,

Physician to St. George's Hospital, London.

ON DISEASES OF THE LUNGS AND AIR-PASSAGES.

Their Pathology, Physical Diagnosis, Symptoms, and Treatment. From the second and revised English edition. In one handsome octavo volume of about 500 pages, extra cloth, $3 50.

Dr. Fuller's work on diseases of the chest was so favorably received, that to many who did not know the extent of his engagements, it was a matter of wonder that it should be allowed to remain three years out of print. Determined, however, to improve it, Dr. Fuller would not consent to a mere reprint, and accordingly we have what might be with perfect justice styled an entirely new work from his pen, the portion of the work treating of the heart and great vessels being excluded. Nevertheless, this volume is of almost equal size with the first.—*London Medical Times and Gazette*, July 20, 1867.

WILLIAMS (C. J. B.), M.D.,

Senior Consulting Physician to the Hospital for Consumption, Brompton, and

WILLIAMS (CHARLES T.), M.D.,

Physician to the Hospital for Consumption.

PULMONARY CONSUMPTION; Its Nature, Varieties, and Treatment.

With an Analysis of One Thousand cases to exemplify its duration. In one neat octavo volume of about 350 pages, extra cloth. (*Just Issued.*) $2 50.

He can still speak from a more enormous experience, and a closer study of the morbid processes involved in tuberculosis, than most living men. He owed it to himself, and to the importance of the subject, to embody his views in a separate work, and we are glad that he has accomplished this duty. After all, the grand teaching which Dr Williams has for the profession is to be found in his therapeutical chapters, and in the history of individual cases extended, by dint of care, over ten, twenty, thirty, and even forty years.—*London Lancet*, Oct. 21, 1871.

His results are more favorable than those of any previous author; but probably there is no malady, the treatment of which has been so much improved within the last twenty years as pulmonary consumption. To ourselves, Dr. Williams's chapters on Treatment are amongst the most valuable and attractive in the book, and would alone render it a standard work of reference. In conclusion, we would record our opinion that Dr. Williams's great reputation is fully maintained by this book. It is undoubtedly one of the most valuable works in the language upon any special disease.—*Lond. Med. Times and Gaz.*, Nov. 4, 1871.

LA ROCHE ON PNEUMONIA. 1 vol. 8vo., extra cloth, of 500 pages Price $3 00.

BUCKLER ON FIBRO-BRONCHITIS AND RHEUMATIC PNEUMONIA. 1 vol. 8vo. $1 25.

FISKE FUND PRIZE ESSAYS ON CONSUMPTION. 1 vol 8vo,, extra cloth, $1 00.

SMITH ON CONSUMPTION; ITS EARLY AND REMEDIABLE STAGES. 1 vol. 8vo., pp. 254. $2 25.

SALTER ON ASTHMA. 1 vol. 8vo. $2 50.

WALSHE ON THE DISEASES OF THE HEART AND GREAT VESSELS. Third American edition. In 1 vol. 8vo., 420 pp , cloth. $3 00.

ROBERTS (WILLIAM), M. D.,
Lecturer on Medicine in the Manchester School of Medicine, &c.

A PRACTICAL TREATISE ON URINARY AND RENAL DISEASES, including Urinary Deposits. Illustrated by numerous cases and engravings. Second Edition, Revised. In one very handsome octavo volume. (*Preparing.*)

BASHAM (W. R.), M. D.,
Senior Physician to the Westminster Hospital, &c.

RENAL DISEASES: a Clinical Guide to their Diagnosis and Treatment. With illustrations. In one neat royal 12mo. volume of 304 pages. $2 00. (*Just Issued.*)

The chapters on diagnosis and treatment are very good, and the student and young practitioner will find them full of valuable practical hints. The third part, on the urine, is excellent, and we cordially recommend its perusal. The author has arranged his matter in a somewhat novel, and, we think, useful form. Here everything can be easily found, and, what is more important, easily read, for all the dry details of larger books here acquire a new interest from the author's arrangement. This part of the book is full of good work.—*Brit. and For. Medico-Chirurgical Review*, July, 1870.

The easy descriptions and compact modes of statement render the book pleasing and convenient.—*Am. Journ. Med. Sciences*, July, 1870.

A book that we believe will be found a valuable assistant to the practitioner and guide to the student. —*Baltimore Med. Journal*, July, 1870.

The treatise of Dr. Basham differs from the rest in its special adaptation to clinical study, and its condensed and almost aphoriemal style, which makes it easily read and easily understood. Besides, the author expresses some new views, which are well worthy of consideration. The volume is a valuable addition to this department of knowledge.—*Pacific Med. and Surg. Journal*, July, 1870.

MORLAND ON RETENTION IN THE BLOOD OF THE ELEMENTS OF THE URINARY SECRETION. 1 vol. 8vo., extra cloth. 75 cents.

JONES (C. HANDFIELD), M. D.,
Physician to St. Mary's Hospital, &c.

CLINICAL OBSERVATIONS ON FUNCTIONAL NERVOUS DISORDERS. Second American Edition. In one handsome octavo volume of 348 pages, extra cloth, $3 25.

Taken as a whole, the work before us furnishes a short but reliable account of the pathology and treatment of a class of very common but certainly highly obscure disorders. The advanced student will find it a rich mine of valuable facts, while the medical practitioner will derive from it many a suggestive hint to aid him in the diagnosis of "nervous cases," and in determining the true indications for their amelioration or cure.—*Amer. Journ. Med. Sci.*, Jan. 1867.

We must cordially recommend it to the profession of this country as supplying, in a great measure, a deficiency which exists in the medical literature of the English language.—*New York Med. Journ.*, April, 1867.

The volume is a most admirable one—full of hints and practical suggestions.—*Canada Med. Journal*, April, 1867.

ESSAYS ON NERVOUS DISEASES. (*Now Ready.*)

ON DISEASES OF THE SPINAL COLUMN AND OF THE NERVES. By C. B. RADCLIFF, M. D., JOHN NETTEN RADCLIFF, J. WARBURTON BEGBIE, M. D., FRANCIS E. AINSTIE, M. D., and J. RUSSELL REYNOLDS, M. D. 1 vol. 8vo., extra cloth, $1 50.

This volume, which has been passing through the Library Department of the "MEDICAL NEWS" for 1870, consists of a series of essays from "Reynolds' System of Medicine" by gentlemen who have paid especial attention to the several affections of the nervous system.

SLADE (D. D.), M.D.

DIPHTHERIA; its Nature and Treatment, with an account of the History of its Prevalence in various Countries. Second and revised edition. In one neat royal 12mo. volume, extra cloth. $1 25.

HUDSON (A.), M. D., M. R. I. A.,
Physician to the Meath Hospital.

LECTURES ON THE STUDY OF FEVER. In one vol. 8vo., extra Cloth, $2 50.

As an admirable summary of the present state of our knowledge concerning fever, the work will be as welcome to the medical man in active practice as to the student. To the hard-worked practitioner who wishes to refresh his notions concerning fever, the book will prove most valuable. . . . . We heartily commend his excellent volume to students and the profession at large.—*London Lancet*, June 22, 1867

The truly philosophical lectures of Dr. Hudson add much to our previous knowledge, all of which they, moreover, analyze and condense. This well-conceived task has been admirably executed in the lectures, illustrative cases and quotations being arranged in an appendix to each. We regret that space forbids our quotation from the lectures on treatment, which are, in regard to research and judgment, most masterly, and evidently the result of extended and mature experience.—*British Medical Journal*, Feb. 22, 1868.

LYONS (ROBERT D.), K. C. C.

A TREATISE ON FEVER; or, Selections from a Course of Lectures on Fever. Being part of a Course of Theory and Practice of Medicine. In one neat octavo volume, of 362 pages, extra cloth. $2 25.

BUMSTEAD (FREEMAN J.), M.D.,

Professor of Venereal Diseases at the Col. of Phys and Surg., New York, &c.

THE PATHOLOGY AND TREATMENT OF VENEREAL DISEASES.

Including the results of recent investigations upon the subject. Third edition, revised and enlarged, with illustrations. In one large and handsome octavo volume of over 700 pages, extra cloth, $5 00; leather, $6 00. (*Just Issued.*)

In preparing this standard work again for the press, the author has subjected it to a very thorough revision. Many portions have been rewritten, and much new matter added, in order to bring it completely on a level with the most advanced condition of syphilography, but by careful compression of the text of previous editions, the work has been increased by only sixty-four pages. The labor thus bestowed upon it, it is hoped, will insure for it a continuance of its position as a complete and trustworthy guide for the practitioner.

It is the most complete book with which we are acquainted in the language. The latest views of the best authorities are put forward, and the information is well arranged—a great point for the student, and still more for the practitioner. The subjects of visceral syphilis, syphilitic affections of the eyes, and the treatment of syphilis by repeated inoculations, are very fully discussed.—*London Lancet*, Jan. 7, 1871.

Dr. Bumstead's work is already so universally known as the best treatise in the English language on venereal diseases, that it may seem almost superfluous to say more of it than that a new edition has been issued. But the author's industry has rendered this new edition virtually a new work, and so merits as much special commendation as if its predecessors had not been published. As a thoroughly practical book on a class of diseases which form a large share of nearly every physician's practice, the volume before us is by far the best of which we have knowledge.—*N. Y. Medical Gazette*, Jan. 28, 1871.

It is rare in the history of medicine to find any one book which contains all that a practitioner needs to know; while the possessor of "Bumstead on Venereal" has no occasion to look outside of its covers for anything practical connected with the diagnosis, history, or treatment of these affections.—*N. Y. Medical Journal*, March, 1871.

CULLERIER (A.), and *BUMSTEAD (FREEMAN J.),*

Surgeon to the Hôpital du Midi.

Professor of Venereal Diseases in the College of Physicians and Surgeons, N. Y.

AN ATLAS OF VENEREAL DISEASES.

Translated and Edited by FREEMAN J. BUMSTEAD. In one large imperial 4to. volume of 328 pages, double-columns, with 26 plates, containing about 150 figures, beautifully colored, many of them the size of life; strongly bound in extra cloth, $17 00; also, in five parts, stout wrappers for mailing, at $3 per part. (*Lately Published.*)

Anticipating a very large sale for this work, it is offered at the very low price of THREE DOLLARS a Part, thus placing it within the reach of all who are interested in this department of practice. Gentlemen desiring early impressions of the plates would do well to order it without delay.

A specimen of the plates and text sent free by mail, on receipt of 25 cents.

We wish for once that our province was not restricted to methods of treatment, that we might say something of the exquisite colored plates in this volume. —*London Practitioner*, May, 1869.

As a whole, it teaches all that can be taught by means of plates and print.—*London Lancet*, March 13, 1869.

Superior to anything of the kind ever before issued on this continent.—*Canada Med. Journal*, March, '69.

The practitioner who desires to understand this branch of medicine thoroughly should obtain this, the most complete and best work ever published.—*Dominion Med. Journal*, May, 1869.

This is a work of master hands on both sides. M. Cullerier is scarcely second to, we think we may truly say is a peer of the illustrious and venerable Ricord, while in this country we do not hesitate to say that Dr. Bumstead, as an authority, is without a rival Assuring our readers that these illustrations tell the whole history of venereal disease, from its inception to its end, we do not know a single medical work, which for its kind is more *necessary* for them to have. —*California Med. Gazette*, March, 1869.

The most splendidly illustrated work in the language, and in our opinion far more useful than the French original.—*Am. Journ. Med. Sciences*, Jan. '69

The fifth and concluding number of this magnificent work has reached us, and we have no hesitation in saying that its illustrations surpass those of previous numbers.—*Boston Med. and Surg. Journal*, Jan. 14, 1869.

Other writers besides M. Cullerier have given us a good account of the diseases of which he treats, but no one has furnished us with such a complete series of illustrations of the venereal diseases. There is, however, an additional interest and value possessed by the volume before us; for it is an American reprint and translation of M. Cullerier's work, with incidental remarks by one of the most eminent American syphilographers, Mr. Bumstead. The letter-press is chiefly M. Cullerier's, but every here and there a few lines or sentences are introduced by Mr. Bumstead; and, as M. Cullerier is a unicist, while Mr. Bumstead is a dualist, this method of treating the subject adds very much to its interest. By this means a liveliness is imparted to the volume which many other treatises sorely lack. It is like reading the report of a conversation or debate; for Mr. Bumstead often finds occasion to question M. Cullerier's statements or inferences, and this he does in a short and forcible way which helps to keep up the attention, and to make the book a very readable one.—*Brit. and For. Medico-Chir. Review*, July, 1869.

HILL (BERKELEY),

Surgeon to the Lock Hospital, London.

ON SYPHILIS AND LOCAL CONTAGIOUS DISORDERS.

In one handsome octavo volume; extra cloth, $3 25. (*Lately Published.*)

Bringing, as it does, the entire literature of the disease down to the present day, and giving with great ability the results of modern research, it is in every respect a most desirable work, and one which should find a place in the library of every surgeon.—*California Med. Gazette*, June, 1869.

Considering the scope of the book and the careful attention to the manifold aspects and details of its subject, it is wonderfully concise All these qualities render it an especially valuable book to the beginner, to whom we would most earnestly recommend its study; while it is no less useful to the practitioner.—*St. Louis Med. and Surg. Journal*, May, 1869.

The most convenient and ready book of reference we have met with.—*N. Y. Med. Record*, May 1, 1869.

Most admirably arranged for both student and practitioner, no other work on the subject equals it; it is more simple, more easily studied.—*Buffalo Med. and Surg. Journal*, March, 1869.

LALLEMAND AND WILSON ON THE CAUSES, SYMPTOMS, AND TREATMENT OF SPERMATORRHŒA. In one vol. 8vo., of about 400 pp., cloth, $2 75.

WILSON (*ERASMUS*), *F.R.S.*

ON DISEASES OF THE SKIN. With Illustrations on wood. Seventh American, from the sixth and enlarged English edition. In one large octavo volume of over 800 pages, $5. (*Lately Published.*)

A SERIES OF PLATES ILLUSTRATING "WILSON ON DISEASES OF THE SKIN;" consisting of twenty beautifully executed plates, of which thirteen are exquisitely colored, presenting the Normal Anatomy and Pathology of the Skin, and embracing accurate representations of about one hundred varieties of disease, most of them the size of nature. Price, in extra cloth, $5 50.

Also, the Text and Plates, bound in one handsome volume. Extra cloth, $10.

The industry and care with which the author has revised the present edition are shown by the fact that the volume has been enlarged by more than a hundred pages. In its present improved form it will therefore doubtless retain the position which it has acquired as a standard and classical authority, while at the same time it has additional claims on the attention of the profession as the latest and most complete work on the subject in the English language.

Such a work as the one before us is a most capital and acceptable help. Mr. Wilson has long been held as high authority in this department of medicine, and his book on diseases of the skin has long been regarded as one of the best text-books extant on the subject. The present edition is carefully prepared, and brought up in its revision to the present time. In this edition we have also included the beautiful series of plates illustrative of the text, and in the last edition published separately. There are twenty of these plates, nearly all of them colored to nature, and exhibiting with great fidelity the various groups of diseases treated of in the body of the work.—*Cincinnati Lancet*, June, 1863.

No one treating skin diseases should be without a copy of this standard work.—*Canada Lancet*, August, 1863.

We can safely recommend it to the profession as the best work on the subject now in existence in the English language.—*Medical Times and Gazette.*

Mr. Wilson's volume is an excellent digest of the actual amount of knowledge of cutaneous diseases; it includes almost every fact or opinion of importance connected with the anatomy and pathology of the skin.—*British and Foreign Medical Review.*

These plates are very accurate, and are executed with an elegance and taste which are highly creditable to the artistic skill of the American artist who executed them.—*St. Louis Med. Journal.*

The drawings are very perfect, and the finish and coloring artistic and correct; the volume is an indispensable companion to the book it illustrates and completes.—*Charleston Medical Journal.*

BY THE SAME AUTHOR.

THE STUDENT'S BOOK OF CUTANEOUS MEDICINE and DISEASES OF THE SKIN. In one very handsome royal 12mo. volume. $3 50. (*Lately Issued.*)

NELIGAN (*J. MOORE*), *M.D., M.R.I.A.*

A PRACTICAL TREATISE ON DISEASES OF THE SKIN. Fifth American, from the second and enlarged Dublin edition by T. W. Belcher, M.D. In one neat royal 12mo. volume of 462 pages, extra cloth. $2 25.

Fully equal to all the requirements of students and young practitioners. It is a work that has stood its ground, that was worthy the reputation of the author, and the high position of which has been maintained by its learned editor.—*Dublin Med. Press and Circular*, Nov. 17, 1869.

Of the remainder of the work we have nothing beyond unqualified commendation to offer. It is so far the most complete one of its size that has appeared, and for the student there can be none which can compare with it in practical value. All the late discoveries in Dermatology have been duly noticed, and their value justly estimated; in a word, the work is fully up to the times, and is thoroughly stocked with most valuable information.—*New York Med. Record*, Jan. 15, 1867.

This instructive little volume appears once more. Since the death of its distinguished author, the study of skin diseases has been considerably advanced, and the results of these investigations have been added by the present editor to the original work of Dr. Neligan. This, however, has not so far increased its bulk as to destroy its reputation as the most convenient manual of diseases of the skin that can be procured by the student.—*Chicago Med. Journal*, Dec. 1866.

BY THE SAME AUTHOR.

ATLAS OF CUTANEOUS DISEASES. In one beautiful quarto volume, with exquisitely colored plates, &c., presenting about one hundred varieties of disease. Extra cloth, $5 50.

The diagnosis of eruptive disease, however, under all circumstances, is very difficult. Nevertheless, Dr. Neligan has certainly, "as far as possible," given a faithful and accurate representation of this class of diseases, and there can be no doubt that these plates will be of great use to the student and practitioner in drawing a diagnosis as to the class, order, and species to which the particular case may belong. While looking over the "Atlas" we have been induced to examine also the "Practical Treatise," and we are inclined to consider it a very superior work, combining accurate verbal description with sound views of the pathology and treatment of eruptive diseases.—*Glasgow Med. Journal.*

A compend which will very much aid the practitioner in this difficult branch of diagnosis. Taken with the beautiful plates of the Atlas, which are remarkable for their accuracy and beauty of coloring, it constitutes a very valuable addition to the library of a practical man.—*Buffalo Med. Journal.*

HILLIER (*THOMAS*), *M.D.*,

Physician to the Skin Department of University College Hospital, &c.

HAND-BOOK OF SKIN DISEASES, for Students and Practitioners. Second American Edition. In one royal 12mo. volume of 358 pp. With Illustrations. Extra cloth, $2 25.

We can conscientiously recommend it to the student; the style is clear and pleasant to read, the matter is good, and the descriptions of diseases, with the modes of treatment recommended, are frequently illustrated with well-recorded cases.—*London Med. Times and Gazette*, April 1, 1865.

It is a concise, plain, practical treatise on the various diseases of the skin; just such a work, indeed, as was much needed, both by medical students and practitioners.—*Chicago Medical Examiner*, May, 1865.

SMITH (*J. LEWIS*), *M. D.*,

Professor of Morbid Anatomy in the Bellevue Hospital Med. College, N. Y.

A COMPLETE PRACTICAL TREATISE ON THE DISEASES OF CHILDREN. Second Edition, revised and greatly enlarged. In one handsome octavo volume. (*Nearly Ready.*)

An original and valuable work.—*Glasgow Med. Journal*, Feb. 1871.

The excellence of this book is one explanation of our not having reviewed it sooner. Taking it up from time to time, we have been freshly interested in its various chapters, and so been led to defer writing our opinion of it. It is one of those works with which we are happily becoming familiar, as coming to us from time to time from across the Atlantic, which contain all that is good in European works of the same kind, together with much that is original, both in reflection and observation. It is astonishing how well the American writers succeed in gleaning, and yet giving a fresh character to their books. This work is an illustration, and pervading every chapter of it is a spirit of sound judgment and common sense, without which any work on any department of the practice of medicine is, to use the mildest word, defective. We are sorry that we cannot give further illustrations of the excellence of this book.—*London Lancet*, Sept. 4, 1869.

We have no work upon the Diseases of Infancy and Childhood which can compare with it.—*Buffalo Med. and Surg. Journal*, March, 1869.

The description of the pathology, symptoms, and treatment of the different diseases is excellent.—*Am. Med. Journal*, April, 1869.

CONDIE (*D. FRANCIS*), *M. D.*

A PRACTICAL TREATISE ON THE DISEASES OF CHILDREN. Sixth edition, revised and augmented. In one large octavo volume of nearly 800 closely-printed pages, extra cloth, $5 25; leather, $6 25. (*Lately Issued.*)

The present edition, which is the sixth, is fully up to the times in the discussion of all those points in the pathology and treatment of infantile diseases which have been brought forward by the German and French teachers. As a whole, however, the work is the best American one that we have, and in its special adaptation to American practitioners it certainly has no equal.—*New York Med. Record*, March 2, 1868.

No other treatise on this subject is better adapted to the American physician. Dr. Condie has long stood before his countrymen as one peculiarly pre-eminent in this department of medicine. His work has been so long a standard for practitioners and medical students that we do no more now than refer to the fact that it has reached its sixth edition. We are glad once more to refresh the impressions of our earlier days by wandering through its pages, and at the same time to be able to recommend it to the youngest members of the profession, as well as to those who have the older editions on their shelves.—*St. Louis Med. Reporter*, Feb. 15, 1868.

WEST (*CHARLES*), *M. D.*,

Physician to the Hospital for Sick Children, &c.

LECTURES ON THE DISEASES OF INFANCY AND CHILDHOOD. Fourth American from the fifth revised and enlarged English edition. In one large and handsome octavo volume of 656 closely-printed pages. Extra cloth, $4 50; leather, $5 50.

Of all the English writers on the diseases of children, there is no one so entirely satisfactory to us as Dr. West. For years we have held his opinion as judicial, and have regarded him as one of the highest living authorities in the difficult department of medical science in which he is most widely known.—*Boston Med. and Surg. Journal*, April 26, 1866.

BY THE SAME AUTHOR. (*Just Ready*)

ON SOME DISORDERS OF THE NERVOUS SYSTEM IN CHILDHOOD; being the Lumleian Lectures delivered at the Royal College of Physicians of London, in March, 1871. In one volume, small 12mo., extra cloth, $1 00.

SMITH (*EUSTACE*), *M. D.*,

Physician to the Northwest London Free Dispensary for Sick Children.

A PRACTICAL TREATISE ON THE WASTING DISEASES OF INFANCY AND CHILDHOOD. Second American, from the second revised and enlarged English edition. In one handsome octavo volume, extra cloth, $2 50. (*Now Ready.*)

This is in every way an admirable book. The modest title which the author has chosen for it scarcely conveys an adequate idea of the many subjects upon which it treats. Wasting is so constant an attendant upon the maladies of childhood, that a treatise upon the wasting diseases of children must necessarily embrace the consideration of many affections of which it is a symptom; and this is excellently well done by Dr. Smith. The book might fairly be described as a practical handbook of the common diseases of children, so numerous are the affections considered either collaterally or directly. We are acquainted with no safer guide to the treatment of children's diseases, and few works give the insight into the physiological and other peculiarities of children that Dr. Smith's book does.—*Brit. Med. Journ.*, April 8, 1871.

GUERSANT (*P.*), *M. D.*,

Honorary Surgeon to the Hospital for Sick Children, Paris.

SURGICAL DISEASES OF INFANTS AND CHILDREN. Translated by R. J. DUNGLISON, M. D. (Publishing in the MEDICAL NEWS AND LIBRARY.)

As this work embodies the experience of twenty years' service in the great Children's Hospital of Paris, it can hardly fail to maintain the reputation of the valuable practical series of volumes which have been laid before the subscribers of the "AMERICAN JOURNAL OF THE MEDICAL SCIENCES." For terms, see p. 3.

DEWEES ON THE PHYSICAL AND MEDICAL TREATMENT OF CHILDREN. Eleventh edition. 1 vol. 8vo. of 548 pages. $2 80.

THOMAS (T. GAILLARD), M. D.,

Professor of Obstetrics, &c in the College of Physicians and Surgeons, N. Y., &c.

A PRACTICAL TREATISE ON THE DISEASES OF WOMEN. Third edition, enlarged and thoroughly revised In one large and handsome octavo volume of 784 pages, with 246 illustrations. Cloth, $5 00; leather, $6 00. (*Now Ready.*)

The author has taken advantage of the opportunity afforded by the call for another edition of this work to render it worthy a continuance of the very remarkable favor with which it has been received. Every portion has been subjected to a conscientious revision, several new chapters have been added, and no labor spared to make it a complete treatise on the most advanced condition of its important subject. The present edition therefore contains about one-third more matter than the previous one, notwithstanding which the price has been maintained at the former very moderate rate, rendering this one of the cheapest volumes accessible to the profession.

If the excellence of a work is to be judged by its rapid sale, this one must take precedence of all others upon the same, or kindred subjects, as evidenced in the short time from its first appearance, in which a new edition is called for, resulting, as we are informed, from the exhaustion of the previous large edition. We deem it scarcely necessery to recommend this work to physicians as it is now widely known, and most of them already possess it, or will certainly do so. To students we unhesitatingly recommend it as the best text-book on diseases of females extant.—*St. Louis Med. Reporter*, June, 1869.

Of all the army of books that have appeared of late years, on the diseases of the uterus and its appendages, we know of none that is so clear, comprehensive, and practical as this of Dr. Thomas', or one that we should more emphatically recommend to the young practitioner, as his guide.—*California Med. Gazette*, June, 1869.

If not the best work extant on the subject of which it treats, it is certainly second to none other. So short a time has elapsed since the medical press teemed with commendatory notices of the first edition, that it would be superfluous to give an extended review of what is now firmly established as *the* American text-book of Gynæcology.—*N. Y. Med. Gazette*, July 17, 1869.

This is a new and revised edition of a work which we recently noticed at some length, and earnestly commended to the favorable attention of our readers. The fact that, in the short space of one year, this second edition makes its appearance, shows that the general judgment of the profession has largely confirmed the opinion we gave at that time.—*Cincinnati Lancet*, Aug. 1869.

It is so short a time since we gave a full review of the first edition of this book, that we deem it only necessary now to call attention to the second appearance of the work. Its success has been remarkable, and we can only congratulate the author on the brilliant reception his book has received.—*N. Y. Med. Journal*, April, 1869.

We regard this treatise as the one best adapted to serve as a text-book on gynæcology.—*St. Louis Med. and Surg. Journal*, May 10, 1869.

The whole work as it now stands is an absolute indispensable to any physician aspiring to treat the diseases of females with success, and according to the most fully accepted views of their ætiology and pathology.—*Leavenworth Medical Herald*, May, 1869.

We have seldom read a medical book in which we found so much to praise, and so little—we can hardly say to object to—to mention with qualified commendation. We had proposed a somewhat extended review with copious extracts, but we hardly know where we should have space for it. We therefore content ourselves with expressing the belief that every practitioner of medicine would do well to possess himself of the work.—*Boston Med. and Surg. Journal*, April 29, 1869.

The number of works published on diseases of women is large, not a few of which are very valuable. But of those which are the most valuable we do not regard the work of Dr. Thomas as second to any. Without being prolix, it treats of the disorders to which it is devoted fully, perspicuously, and satisfactorily. It will be found a treasury of knowledge to every physician who turns to its pages. We would like to make a number of quotations from the work of a practical bearing, but our space will not permit. The work should find a place in the libraries of all physicians.—*Cincinnati Med. Repertory*, May, 1869.

No one will be surprised to learn that the valuable, readable, and thoroughly practical book of Professor Thomas has so soon advanced to a second edition. Although very little time has necessarily been allowed our author for revision and improvement of the work, he has performed it exceedingly well. Aside from the numerous corrections which he has found necessary to make, he has added an admirable chapter on chlorosis, which of itself is worth the cost of the volume.—*N. Y. Med. Record*, May 15, 1869.

CHURCHILL (FLEETWOOD), M. D., M. R. I. A.

ESSAYS ON THE PUERPERAL FEVER, AND OTHER DISEASES PECULIAR TO WOMEN. Selected from the writings of British Authors previous to the close of the Eighteenth Century. In one neat octavo volume of about 450 pages, extra cloth. $2 50.

ASHWELL (SAMUEL), M. D.,

Late Obstetric Physician and Lecturer at Guy's Hospital.

A PRACTICAL TREATISE ON THE DISEASES PECULIAR TO WOMEN. Illustrated by Cases derived from Hospital and Private Practice. Third American, from the Third and revised London edition. In one octavo volume, extra cloth, of 528 pages. $3 50.

DEWEES'S TREATISE ON THE DISEASES OF FEMALES. With illustrations. Eleventh Edition, with the Author's last improvements and corrections. In one octavo volume of 536 pages, with plates, extra cloth, $3 00.

BARNES (ROBERT), M. D., F. R. C. P.,

Obstetric Physician to St. Thomas' Hospital, &c.

A PRACTICAL TREATISE ON THE DISEASES OF WOMEN. In one handsome octavo volume with illustrations. (*Preparing.*)

HODGE (HUGH L.), M.D.,

Emeritus Professor of Obstetrics, &c., in the University of Pennsylvania.

ON DISEASES PECULIAR TO WOMEN; including Displacements of the Uterus.

With original illustrations. Second edition, revised and enlarged. In one beautifully printed octavo volume of 531 pages, extra cloth. $4 50. (*Lately Issued.*)

In the preparation of this edition the author has spared no pains to improve it with the results of his observation and study during the interval which has elapsed since the first appearance of the work. Considerable additions have thus been made to it, which have been partially accommodated by an enlargement in the size of the page, to avoid increasing unduly the bulk of the volume.

From PROF. W. H. BYFORD, *of the Rush Medical College, Chicago.*

The book bears the impress of a master hand, and must, as its predecessor, prove acceptable to the profession. In diseases of women Dr. Hodge has established a school of treatment that has become worldwide in fame.

Professor Hodge's work is truly an original one from beginning to end, consequently no one can peruse its pages without learning something new. The book, which is by no means a large one, is divided into two grand sections, so to speak: first, that treating of the nervous sympathies of the uterus, and, secondly, that which speaks of the mechanical treatment of displacements of that organ. He is disposed, as a nonbeliever in the frequency of inflammations of the uterus, to take strong ground against many of the highest authorities in this branch of medicine, and the arguments which he offers in support of his position are, to say the least, well put. Numerous woodcuts adorn this portion of the work, and add incalculably to the proper appreciation of the variously shaped instruments referred to by our author. As a contribution to the study of women's diseases, it is of great value, and is abundantly able to stand on its own merits.—*N. Y. Medical Record*, Sept. 15, 1868.

In this point of view, the treatise of Professor Hodge will be indispensable to every student in its department. The large, fair type and general perfection of workmanship will render it doubly welcome.—*Pacific Med. and Surg. Journal*, Oct. 1868.

WEST (CHARLES), M.D.

LECTURES ON THE DISEASES OF WOMEN.

Third American, from the Third London edition. In one neat octavo volume of about 550 pages, extra cloth. $3 75; leather, $4 75.

The reputation which this volume has acquired as a standard book of reference in its department, renders it only necessary to say that the present edition has received a careful revision at the hands of the author, resulting in a considerable increase of size. A few notices of previous editions are subjoined.

The manner of the author is excellent, his descriptions graphic and perspicuous, and his treatment up to the level of the time—clear, precise, definite, and marked by strong common sense.—*Chicago Med. Journal*, Dec. 1861.

We cannot too highly recommend this, the second edition of Dr. West's excellent lectures on the diseases of females. We know of no other book on this subject from which we have derived as much pleasure and instruction. Every page gives evidence of the honest, earnest, and diligent searcher after truth. He is not the mere compiler of other men's ideas, but his lectures are the result of ten years' patient investigation in one of the widest fields for women's diseases—St. Bartholomew's Hospital. As a teacher, Dr. West is simple and earnest in his language, clear and comprehensive in his perceptions, and logical in his deductions.—*Cincinnati Lancet*, Jan. 1862.

We return the author our grateful thanks for the vast amount of instruction he has afforded us. His valuable treatise needs no eulogy on our part! His graphic diction and truthful pictures of disease all speak for themselves.—*Medico-Chirurg. Review.*

Most justly esteemed a standard work. . . . . It bears evidence of having been carefully revised, and is well worthy of the fame it has already obtained.—*Dub. Med. Quar. Jour.*

As a writer, Dr. West stands, in our opinion, second only to Watson, the "Macaulay of Medicine;" he possesses that happy faculty of clothing instruction in easy garments; combining pleasure with profit, he leads his pupils, in spite of the ancient proverb, along a royal road to learning. His work is one which will not satisfy the extreme on either side, but it is one that will please the great majority who are seeking truth, and one that will convince the student that he has committed himself to a candid, safe, and valuable guide.—*N. A. Med.-Chirurg Review.*

We must now conclude this hastily written sketch with the confident assurance to our readers that the work will well repay perusal. The conscientious, painstaking, practical physician is apparent on every page.—*N. Y. Journal of Medicine.*

We have to say of it, briefly and decidedly, that it is the best work on the subject in any language, and that it stamps Dr. West as the *facile princeps* of British obstetric authors.—*Edinburgh Med. Journal.*

We gladly recommend his lectures as in the highest degree instructive to all who are interested in obstetric practice.—*London. Lancet.*

We know of no treatise of the kind so complete, and yet so compact.—*Chicago Med. Journal.*

BY THE SAME AUTHOR.

AN ENQUIRY INTO THE PATHOLOGICAL IMPORTANCE OF ULCERATION OF THE OS UTERI.

In one neat octavo volume, extra cloth. $1 25.

MEIGS (CHARLES D.), M. D.,

Late Professor of Obstetrics, &c. in Jefferson Medical College, Philadelphia.

WOMAN: HER DISEASES AND THEIR REMEDIES.

A Series of Lectures to his Class. Fourth and Improved edition. In one large and beautifully printed octavo volume of over 700 pages, extra cloth, $5 00; leather, $6 00.

Y THE SAME AUTHOR.

ON THE NATURE, SIGNS, AND TREATMENT OF CHILDBED FEVER.

In a Series of Letters addressed to the Students of his Class. In one handsome octavo volume of 365 pages, extra cloth. $2 00.

HODGE (HUGH L.), M.D.,

Emeritus Professor of Midwifery, &c. in the University of Pennsylvania, &c.

THE PRINCIPLES AND PRACTICE OF OBSTETRICS. Illustrated with large lithographic plates containing one hundred and fifty-nine figures from original photographs, and with numerous wood-cuts. In one large and beautifully printed quarto volume of 550 double-columned pages, strongly bound in extra cloth, $14.

The work of Dr. Hodge is something more than a simple presentation of his particular views in the department of Obstetrics; it is something more than an ordinary treatise on midwifery; it is, in fact, a cyclopædia of midwifery. He has aimed to embody in a single volume the whole science and art of Obstetrics. An elaborate text is combined with accurate and varied pictorial illustrations, so that no fact or principle is left unstated or unexplained.—*Am. Med. Times*, Sept. 3, 1864.

We should like to analyze the remainder of this excellent work, but already has this review extended beyond our limited space. We cannot conclude this notice without referring to the excellent finish of the work. In typography it is not to be excelled; the paper is superior to what is usually afforded by our American cousins, quite equal to the best of English books. The engravings and lithographs are most beautifully executed. The work recommends itself for its originality, and is in every way a most valuable addition to those on the subject of obstetrics.—*Canada Med. Journal*, Oct. 1864.

It is very large, profusely and elegantly illustrated, and is fitted to take its place near the works of great obstetricians. Of the American works on the subject it is decidedly the best.—*Edinb. Med. Jour.*, Dec. '64.

We have examined Professor Hodge's work with great satisfaction; every topic is elaborated most fully. The views of the author are comprehensive, and concisely stated. The rules of practice are judicious, and will enable the practitioner to meet every emergency of obstetric complication with confidence. —*Chicago Med. Journal*, Aug. 1864.

More time than we have had at our disposal since we received the great work of Dr. Hodge is necessary to do it justice. It is undoubtedly by far the most original, complete, and carefully composed treatise on the principles and practice of Obstetrics which has ever been issued from the American press.—*Pacific Med. and Surg. Journal*, July, 1864.

We have read Dr. Hodge's book with great pleasure, and have much satisfaction in expressing our commendation of it as a whole. It is certainly highly instructive, and in the main, we believe, correct. The great attention which the author has devoted to the mechanism of parturition, taken along with the conclusions at which he has arrived, point, we think, conclusively to the fact that, in Britain at least, the doctrines of Naegele have been too blindly received. —*Glasgow Med. Journal*, Oct. 1864.

⁂ Specimens of the plates and letter-press will be forwarded to any address, free by mail, on receipt of six cents in postage stamps.

TANNER (THOMAS H.), M. D.

ON THE SIGNS AND DISEASES OF PREGNANCY. First American from the Second and Enlarged English Edition. With four colored plates and illustrations on wood. In one handsome octavo volume of about 500 pages, extra cloth, $4 25.

The very thorough revision the work has undergone has added greatly to its practical value, and increased materially its efficiency as a guide to the student and to the young practitioner.—*Am. Journ. Med. Sci.*, April, 1868.

With the immense variety of subjects treated of and the ground which they are made to cover, the impossibility of giving an extended review of this truly remarkable work must be apparent. We have not a single fault to find with it, and most heartily commend it to the careful study of every physician who would not only always be sure of his diagnosis of pregnancy, but always ready to treat all the numerous ailments that are, unfortunately for the civilized women of to-day, so commonly associated with the function.—*N. Y. Med. Record*, March 16, 1868.

We have much pleasure in calling the attention of our readers to the volume produced by Dr. Tanner, the second edition of a work that was, in its original state even, acceptable to the profession. We recommend obstetrical students, young and old, to have this volume in their collections. It contains not only a fair statement of the signs, symptoms, and diseases of pregnancy, but comprises in addition much interesting relative matter that is not to be found in any other work that we can name.—*Edinburgh Med. Journal*, Jan. 1868.

In its treatment of the signs and diseases of pregnancy it is the most complete book we know of, abounding on every page with matter valuable to the general practitioner.—*Cincinnati Med. Repertory*, March, 1868.

This is a most excellent work, and should be on the table or in the library of every practitioner.—*Humboldt Med. Archives*, Feb. 1868.

A valuable compendium, enriched by his own labors, of all that is known on the signs and diseases of pregnancy.—*St. Louis Med. Reporter*, Feb. 15, 1868.

SWAYNE (JOSEPH GRIFFITHS), M. D.,

Physician-Accoucheur to the British General Hospital, &c.

OBSTETRIC APHORISMS FOR THE USE OF STUDENTS COMMENCING MIDWIFERY PRACTICE. From the Fourth and Revised London Edition, with Additions by E. R. HUTCHINS, M. D. With Illustrations. In one neat 12mo. volume. Extra cloth, $1 25. (*Lately Published.*)

It is really a capital little compendium of the subject, and we recommend young practitioners to buy it and carry it with them when called to attend cases of labor. They can while away the otherwise tedious hours of waiting, and thoroughly fix in their memories the most important practical suggestions it contains. The American editor has materially added by his notes and the concluding chapters to the completeness and general value of the book.—*Chicago Med. Journal*, Feb. 1870.

The manual before us contains in exceedingly small compass—small enough to carry in the pocket—about all there is of obstetrics, condensed into a nutshell of Aphorisms. The illustrations are well selected, and serve as excellent reminders of the conduct of labor—regular and difficult.—*Cincinnati Lancet*, April, '70.

This is a most admirable little work, and completely answers the purpose. It is not only valuable for young beginners, but no one who is not a proficient in the art of obstetrics should be without it, because it condenses all that is necessary to know for ordinary midwifery practice. We commend the book most favorably.—*St. Louis Med. and Surg. Journal*, Sept. 10, 1870.

A studied perusal of this little book has satisfied us of its eminently practical value. The object of the work, the author says, in his preface, is to give the student a few brief and practical directions respecting the management of ordinary cases of labor; and also to point out to him in extraordinary cases when and how he may act upon his own responsibility, and when he ought to send for assistance.—*N. Y. Medical Journal*, May, 1870.

MEIGS (CHARLES D.), M. D.,
Lately Professor of Obstetrics, &c., in the Jefferson Medical College, Philadelphia.

OBSTETRICS: THE SCIENCE AND THE ART. Fifth edition, revised. With one hundred and thirty illustrations. In one beautifully printed octavo volume of 760 large pages. Extra cloth, $5 50; leather, $6 50.

It is to the student that our author has more particularly addressed himself; but to the practitioner we believe it would be equally serviceable as a book of reference. No work that we have met with so thoroughly details everything that falls to the lot of the accoucheur to perform. Every detail, no matter how minute or how trivial, has found a place.—*Canada Medical Journal*, July, 1867.

The original edition is already so extensively and favorably known to the profession that no recommendation is necessary; it is sufficient to say, the present edition is very much extended, improved, and perfected. Whilst the great practical talents and unlimited experience of the author render it a most valuable acquisition to the practitioner, it is so condensed as to constitute a most eligible and excellent text-book for the student.—*Southern Med. and Surg. Journal*, July, 1867.

RAMSBOTHAM (FRANCIS H.), M.D.

THE PRINCIPLES AND PRACTICE OF OBSTETRIC MEDICINE AND SURGERY, in reference to the Process of Parturition. A new and enlarged edition, thoroughly revised by the author. With additions by W. V. KEATING, M. D., Professor of Obstetrics, &c., in the Jefferson Medical College, Philadelphia. In one large and handsome imperial octavo volume of 650 pages, strongly bound in leather, with raised bands; with sixty-four beautiful plates, and numerous wood-cuts in the text, containing in all nearly 200 large and beautiful figures. $7 00.

We will only add that the student will learn from it all he need to know, and the practitioner will find it, as a book of reference, surpassed by none other.—*Stethoscope.*

The character and merits of Dr. Ramsbotham's work are so well known and thoroughly established, that comment is unnecessary and praise superfluous. The illustrations, which are numerous and accurate, are executed in the highest style of art. We cannot too highly recommend the work to our readers.—*St. Louis Med. and Surg. Journal.*

To the physician's library it is indispensable, while to the student, as a text-book, from which to extract the material for laying the foundation of an education on obstetrical science, it has no superior.—*Ohio Med. and Surg. Journal.*

When we call to mind the toil we underwent in acquiring a knowledge of this subject, we cannot but envy the student of the present day the aid which this work will afford him.—*Am. Jour. of the Med. Sciences.*

CHURCHILL (FLEETWOOD), M.D., M.R.I.A.

ON THE THEORY AND PRACTICE OF MIDWIFERY. A new American from the fourth revised and enlarged London edition. With notes and additions by D. FRANCIS CONDIE, M. D., author of a "Practical Treatise on the Diseases of Children," &c. With one hundred and ninety-four illustrations. In one very handsome octavo volume of nearly 700 large pages. Extra cloth, $4 00; leather, $5 00.

In adapting this standard favorite to the wants of the profession in the United States, the editor has endeavored to insert everything that his experience has shown him would be desirable for the American student, including a large number of illustrations. With the sanction of the author, he has added, in the form of an appendix, some chapters from a little "Manual for Midwives and Nurses," recently issued by Dr. Churchill, believing that the details there presented can hardly fail to prove of advantage to the junior practitioner. The result of all these additions is that the work now contains fully one-half more matter than the last American edition, with nearly one-half more illustrations; so that, notwithstanding the use of a smaller type, the volume contains almost two hundred pages more than before.

These additions render the work still more complete and acceptable than ever; and with the excellent style in which the publishers have presented this edition of Churchill, we can commend it to the profession with great cordiality and pleasure.—*Cincinnati Lancet.*

Few works on this branch of medical science are equal to it, certainly none excel it, whether in regard to theory or practice, and in one respect it is superior to all others, viz., in its statistical information, and therefore, on these grounds a most valuable work for the physician, student, or lecturer, all of whom will find in it the information which they are seeking.—*Brit. Am. Journal.*

The present treatise is very much enlarged and amplified beyond the previous editions but nothing has been added which could be well dispensed with. An examination of the table of contents shows how thoroughly the author has gone over the ground, and the care he has taken in the text to present the subjects in all their bearings, will render this new edition even more necessary to the obstetric student than were either of the former editions at the date of their appearance. No treatise on obstetrics with which we are acquainted can compare favorably with this, in respect to the amount of material which has been gathered from every source.—*Boston Med. and Surg. Journal.*

There is no better text-book for students, or work of reference and study for the practising physician than this. It should adorn and enrich every medical library.—*Chicago Med. Journal.*

MONTGOMERY (W. F.), M. D.,
Professor of Midwifery in the King's and Queen's College of Physicians in Ireland.

AN EXPOSITION OF THE SIGNS AND SYMPTOMS OF PREGNANCY. With some other Papers on Subjects connected with Midwifery. From the second and enlarged English edition. With two exquisite colored plates, and numerous wood-cuts. In one very handsome octavo volume of nearly 600 pages, extra cloth. $3 75.

RIGBY'S SYSTEM OF MIDWIFERY. With Notes and Additional Illustrations. Second American edition. One volume octavo, extra cloth, 422 pages. $2 50.

DEWEES'S COMPREHENSIVE SYSTEM OF MIDWIFERY. Twelfth edition, with the author's last improvements and corrections. In one octavo volume, extra cloth, of 600 pages. $3 50.

GROSS (SAMUEL D.), M.D.,

Professor of Surgery in the Jefferson Medical College of Philadelphia.

A SYSTEM OF SURGERY: Pathological, Diagnostic, Therapeutic, and Operative. Illustrated by upwards of Thirteen Hundred Engravings. Fourth edition, carefully revised, and improved. In two large and beautifully printed royal octavo volumes of 2200 pages, strongly bound in leather, with raised bands. $15 00.

The continued favor, shown by the exhaustion of successive large editions of this great work, proves that it has successfully supplied a want felt by American practitioners and students. Though but little over six years have elapsed since its first publication, it has already reached its fourth edition, while the care of the author in its revision and correction has kept it in a constantly improved shape. By the use of a close, though very legible type, an unusually large amount of matter is condensed in its pages, the two volumes containing as much as four or five ordinary octavos. This, combined with the most careful mechanical execution, and its very durable binding, renders it one of the cheapest works accessible to the profession. Every subject properly belonging to the domain of surgery is treated in detail, so that the student who possesses this work may be said to have in it a surgical library.

It must long remain the most comprehensive work on this important part of medicine.—*Boston Medical and Surgical Journal*, March 23, 1865.

We have compared it with most of our standard works, such as those of Erichsen, Miller, Fergusson, Syme, and others, and we must, in justice to our author, award it the pre-eminence. As a work, complete in almost every detail, no matter how minute or trifling, and embracing every subject known in the principles and practice of surgery, we believe it stands without a rival. Dr. Gross, in his preface, remarks "my aim has been to embrace the whole domain of surgery, and to allot to every subject its legitimate claim to notice;" and, we assure our readers, he has kept his word. It is a work which we can most confidently recommend to our brethren, for its utility is becoming the more evident the longer it is upon the shelves of our library.—*Canada Med. Journal*, September, 1865.

The first two editions of Professor Gross' System of Surgery are so well known to the profession, and so highly prized, that it would be idle for us to speak in praise of this work.—*Chicago Medical Journal*, September, 1865.

We gladly indorse the favorable recommendation of the work, both as regards matter and style, which we made when noticing its first appearance.—*British and Foreign Medico-Chirurgical Review*, Oct. 1865.

The most complete work that has yet issued from the press on the science and practice of surgery.—*London Lancet*.

This system of surgery is, we predict, destined to take a commanding position in our surgical literature, and be the crowning glory of the author's well earned fame. As an authority on general surgical subjects, this work is long to occupy a pre-eminent place, not only at home, but abroad. We have no hesitation in pronouncing it without a rival in our language, and equal to the best systems of surgery in any language.—*N. Y. Med. Journal*.

Not only by far the best text-book on the subject, as a whole, within the reach of American students, but one which will be much more than ever likely to be resorted to and regarded as a high authority abroad.—*Am. Journal Med. Sciences*, Jan. 1865.

The work contains everything, minor and major, operative and diagnostic, including mensuration and examination, venereal diseases, and uterine manipulations and operations. It is a complete Thesaurus of modern surgery, where the student and practitioner shall not seek in vain for what they desire.—*San Francisco Med. Press*, Jan. 1865.

Open it where we may, we find sound practical information conveyed in plain language. This book is no mere provincial or even national system of surgery, but a work which, while very largely indebted to the past, has a strong claim on the gratitude of the future of surgical science.—*Edinburgh Med. Journal*, Jan. 1865.

A glance at the work is sufficient to show that the author and publisher have spared no labor in making it the most complete "System of Surgery" ever published in any country.—*St. Louis Med. and Surg Journal*, April, 1865.

A system of surgery which we think unrivalled in our language, and which will indelibly associate his name with surgical science. And what, in our opinion, enhances the value of the work is that, while the practising surgeon will find all that he requires in it, it is at the same time one of the most valuable treatises which can be put into the hands of the student seeking to know the principles and practice of this branch of the profession which he designs subsequently to follow.—*The Brit. Am. Journ., Montreal.*

BY THE SAME AUTHOR.

A PRACTICAL TREATISE ON FOREIGN BODIES IN THE AIR-PASSAGES. In 1 vol. 8vo. cloth, with illustrations. pp. 468. $2 75.

SKEY'S OPERATIVE SURGERY. In 1 vol. 8vo. cloth, of over 650 pages; with about 100 wood-cuts. $3 25

COOPER'S LECTURES ON THE PRINCIPLES AND PRACTICE OF SURGERY. In 1 vol. 8vo. cloth, 750 p. $2.

GIBSON'S INSTITUTES AND PRACTICE OF SURGERY. Eighth edition, improved and altered. With thirty-four plates. In two handsome octavo volumes, about 1000 pp., leather, raised bands. $6 50.

MILLER (JAMES),

Late Professor of Surgery in the University of Edinburgh, &c.

PRINCIPLES OF SURGERY. Fourth American, from the third and revised Edinburgh edition. In one large and very beautiful volume of 700 pages, with two hundred and forty illustrations on wood, extra cloth. $3 75.

BY THE SAME AUTHOR.

THE PRACTICE OF SURGERY. Fourth American, from the last Edinburgh edition. Revised by the American editor. Illustrated by three hundred and sixty-four engravings on wood. In one large octavo volume of nearly 700 pages, extra cloth. $3 75.

SARGENT (F. W.), M. D.

ON BANDAGING AND OTHER OPERATIONS OF MINOR SURGERY. New edition, with an additional chapter on Military Surgery. One handsome royal 12mo. volume, of nearly 400 pages, with 184 wood-cuts. Extra cloth, $1 75.

ASHHURST (JOHN, Jr.), M.D.,

Surgeon to the Episcopal Hospital, Philadelphia.

THE PRINCIPLES AND PRACTICE OF SURGERY. In one very large and handsome octavo volume of about 1000 pages, with nearly 550 illustrations, extra cloth, $6 50; leather, raised bands, $7 50. (*Just Ready.*)

The object of the author has been to present, within as condensed a compass as possible, a complete treatise on Surgery in all its branches, suitable both as a text-book for the student and a work of reference for the practitioner. So much has of late years been done for the advancement of Surgical Art and Science, that there seemed to be a want of a work which should present the latest aspects of every subject, and which, by its American character, should render accessible to the profession at large the experience of the practitioners of both hemispheres. This has been the aim of the author, and it is hoped that the volume will be found to fulfil its purpose satisfactorily. The plan and general outline of the work will be seen by the annexed

CONDENSED SUMMARY OF CONTENTS.

CHAPTER I. Inflammation. II. Treatment of Inflammation. III. Operations in general: Anæsthetics. IV. Minor Surgery. V. Amputations. VI. Special Amputations. VII. Effects of Injuries in General: Wounds. VIII. Gunshot Wounds. IX. Injuries of Bloodvessels. X. Injuries of Nerves, Muscles and Tendons, Lymphatics, Bursæ, Bones, and Joints. XI. Fractures. XII. Special Fractures. XIII. Dislocations. XIV. Effects of Heat and Cold. XV. Injuries of the Head. XVI. Injuries of the Back. XVII. Injuries of the Face and Neck. XVIII. Injuries of the Chest. XIX. Injuries of the Abdomen and Pelvis. XX. Diseases resulting from Inflammation. XXI. Erysipelas. XXII. Pyæmia. XXIII. Diathetic Diseases: Struma (including Tubercle and Scrofula): Rickets. XXIV. Venereal Diseases; Gonorrhœa and Chancroid. XXV. Venereal Diseases continued: Syphilis. XXVI. Tumors. XXVII. Surgical Diseases of Skin, Areolar Tissue, Lymphatics, Muscles, Tendons, and Bursæ. XXVIII. Surgical Disease of Nervous System (including Tetanus). XXIX. Surgical Diseases of Vascular System (including Aneurism). XXX. Diseases of Bone. XXXI. Diseases of Joints. XXXII. Excisions. XXXIII. Orthopædic Surgery. XXXIV. Diseases of Head and Spine. XXXV. Diseases of the Eye. XXXVI. Diseases of the Ear. XXXVII. Diseases of the Face and Neck. XXXVIII. Diseases of the Mouth, Jaws, and Throat. XXXIX. Diseases of the Breast. XL Hernia. XLI. Special Herniæ. XLII. Diseases of Intestinal Canal. XLIII. Diseases of Abdominal Organs, and various operations on the Abdomen. XLIV. Urinary Calculus. LXV. Diseases of Bladder and Prostate. XLVI. Diseases of Urethra. XLVII. Diseases of Generative Organs. INDEX.

Its author has evidently tested the writings and experiences of the past and present in the crucible of a careful, analytic, and honorable mind, and faithfully endeavored to bring his work up to the level of the highest standard of practical surgery He is frank and definite, and gives us opinions, and generally sound ones, instead of a mere *résumé* of the opinions of others He is conservative, but not hidebound by authority. His style is clear, elegant, and scholarly. The work is an admirable text book, and a useful book of reference It is a credit to American professional literature, and one of the first ripe fruits of the soil fertilized by the blood of our late unhappy war.—*N. Y. Med. Record*, Feb. 1, 1872.

Indeed, the work as a whole must be regarded as an excellent and concise exponent of modern surgery, and as such it will be found a valuable text-book for the student, and a useful book of reference for the general practitioner.—*N. Y. Med. Journal*, Feb. 1872.

It gives us great pleasure to call the attention of the profession to this excellent work. Our knowledge of its talented and accomplished author led us to expect from him a very valuable treatise upon subjects to which he has repeatedly given evidence of having profitably devoted much time and labor, and we are in no way disappointed.—*Phila. Med. Times*, Feb. 1, 1872.

ERICHSEN (JOHN),

Senior Surgeon to University College Hospital.

THE SCIENCE AND ART OF SURGERY; being a Treatise on Surgical Injuries, Diseases, and Operations. From the Fifth enlarged and carefully revised London Edition. With Additions by JOHN ASHHURST, Jr., M. D., Surgeon to the Episcopal Hospital, &c. Illustrated by over six hundred Engravings on wood. In one very large and beautifully printed imperial octavo volume, containing over twelve hundred closely printed pages: cloth, $7 50; leather, raised bands, $8 50. (*Lately Published.*)

Erichsen's Surgery needs no review at the present day. Long ago it took and has since maintained a leading position in surgical literature, and this position is so firmly held, that no efforts on the part of a reviewer would serve to weaken the estimate which has been placed upon the book—nor, indeed, could they materially strengthen it. The duty, then, devolving upon us is simply to note the appearance of this new edition, and to point out the improvements therein made.—*N. Y. Med. Journal*, Jan. 1870.

In the recent republication in this country of the last London edition of "Erichsen's Surgery" the practitioner and student are supplied with a guide and text-book which apparently leaves nothing to be desired. Full and complete in every essential particular, and inculcating the most advanced and correct modes of practice, it is certain to come into very general use. The additions of Dr. Ashhurst, though not extensive, are to the point; they relate chiefly to items of American practice.—*The Journal of Psychological Medicine*, Jan. 1870.

BY THE SAME AUTHOR. (Just Issued.)

ON RAILWAY, AND OTHER INJURIES OF THE NERVOUS SYSTEM. In small octavo volume. Extra cloth, $1 00.

PIRRIE (WILLIAM), F. R. S. E.,

Professor of Surgery in the University of Aberdeen.

THE PRINCIPLES AND PRACTICE OF SURGERY. Edited by JOHN NEILL, M. D., Professor of Surgery in the Penna. Medical College, Surgeon to the Pennsylvania Hospital, &c. In one very handsome octavo volume of 780 pages, with 316 *illustrations, extra cloth.* $3 75.

DRUITT (ROBERT), M.R.C.S., &c.

THE PRINCIPLES AND PRACTICE OF MODERN SURGERY.

A new and revised American, from the eighth enlarged and improved London edition. Illustrated with four hundred and thirty-two wood-engravings. In one very handsome octavo volume, of nearly 700 large and closely printed pages. Extra cloth, $4 00; leather, $5 00.

All that the surgical student or practitioner could desire.—*Dublin Quarterly Journal.*

It is a most admirable book. We do not know when we have examined one with more pleasure.—*Boston Med. and Surg. Journal.*

In Mr. Druitt's book, though containing only some seven hundred pages, both the principles and the practice of surgery are treated, and so clearly and perspicuously, as to elucidate every important topic. The fact that twelve editions have already been called for, in these days of active competition, would of itself show it to possess marked superiority. We have examined the book most thoroughly, and can say that this success is well merited. His book, moreover, possesses the inestimable advantages of having the subjects perfectly well arranged and classified, and of being written in a style at once clear and succinct.—*Am. Journal of Med. Sciences.*

Whether we view Druitt's Surgery as a guide to operative procedures, or as representing the latest theoretical surgical opinions, no work that we are at present acquainted with can at all compare with it. It is a compendium of surgical theory (if we may use the word) and practice in itself, and well deserves the estimate placed upon it.—*Brit. Am. Journal.*

Thus enlarged and improved, it will continue to rank among our best text-books on elementary surgery.—*Columbus Rev. of Med. and Surg.*

We must close this brief notice of an admirable work by recommending it to the earnest attention of every medical student.—*Charleston Medical Journal and Review.*

A text-book which the general voice of the profession in both England and America has commended as one of the most admirable "manuals," or, "*vade mecum*," as its English title runs, which can be placed in the hands of the student. The merits of Druitt's Surgery are too well known to every one to need any further eulogium from us.—*Nashville Med. Journal.*

HAMILTON (FRANK H.), M.D.,

Professor of Fractures and Dislocations, &c., in Bellevue Hosp. Med. College, New York.

A PRACTICAL TREATISE ON FRACTURES AND DISLOCATIONS.

Fourth edition, thoroughly revised. In one large and handsome octavo volume of nearly 800 pages, with several hundred illustrations. Extra cloth, $5 75; leather, $6 75. (*Just Issued.*)

In revising this standard work, the author has omitted much which the progress of science has seemed to render less important, and has thus gained room for a large amount of new matter, so that with but little increase in the size of the volume he has yet been able to present the subject in its most recent aspect. The series of illustrations has likewise undergone a thorough revision; nearly one-fourth of the wood-cuts in the last edition have been rejected, and their places supplied, for the most part, with original drawings, representing the most approved forms of apparel, and the latest views with regard to the pathology of fractures and dislocations. In its present improved form, therefore, it is hoped that the volume may maintain the character which it has acquired of a standard authority on every detail of its important subject.

It is not, of course, our intention to review *in extenso*, Hamilton on "Fractures and Dislocations." Eleven years ago such review might not have been out of place; to-day the work is an authority, so well, so generally, and so favorably known, that it only remains for the reviewer to say that a new edition is just out, and it is better than either of its predecessors.—*Cincinnati Clinic*, Oct. 14, 1871.

Undoubtedly the best work on Fractures and Dislocations in the English language.—*Cincinnati Med. Repertory*, Oct. 1871.

We have once more before us Dr. Hamilton's admirable treatise, which we have always considered the most complete and reliable work on the subject. As a whole, the work is without an equal in the literature of the profession.—*Boston Med. and Surg. Journ.*, Oct. 12, 1871.

It is unnecessary at this time to commend the book, except to such as are beginners in the study of this particular branch of surgery. Every practical surgeon in this country and abroad knows of it as a most trustworthy guide, and one which they, in common with us, would unqualifiedly recommend as the highest authority in any language.—*N. Y. Med. Record*, Oct 16, 1871.

ASHTON (T. J.).

ON THE DISEASES, INJURIES, AND MALFORMATIONS OF THE RECTUM AND ANUS;

with remarks on Habitual Constipation. Second American, from the fourth and enlarged London edition. With handsome illustrations. In one very beautifully printed octavo volume of about 300 pages. $3 25.

We can recommend this volume of Mr Ashton's in the strongest terms, as containing all the latest details of the pathology and treatment of diseases connected with the rectum.—*Canada Med. Journ.*, March, 1866.

One of the most valuable special treatises that the physician and surgeon can have in his library.—*Chicago Medical Examiner*, Jan. 1866.

The short period which has elapsed since the appearance of the former American reprint, and the numerous editions published in England, are the best arguments we can offer of the merits, and of the uselessness of any commendation on our part of a book already so favorably known to our readers.—*Boston Med. and Surg. Journal*, Jan. 25, 1866.

BIGELOW (HENRY J.), M. D.,

Professor of Surgery in the Massachusetts Med. College.

ON THE MECHANISM OF DISLOCATION AND FRACTURE OF THE HIP.

With the Reduction of the Dislocation by the Flexion Method. With numerous original illustrations. In one very handsome octavo volume. Cloth. $2 50. (*Lately Issued.*)

We cannot too highly praise this book as the work of an accomplished and scientific surgeon. We do not hesitate to say that he has done much to clear up the obscurities connected with the mechanism of dislocation of the hip-joint, and he has laid down most valuable practical rules for the easy and most successful management of these injuries. The monograph is largely illustrated with exquisitely executed woodcuts, after photographs, which help to elucidate the admirable subject-matter of the text. We cordially commend the "Hip," by Dr. Bigelow, to the attention of surgeons.—*Dublin Quarterly Journal of Medical Science*, Feb. 1870.

WELLS (J. SOELBERG),

Professor of Ophthalmology in King's College Hospital, &c.

A TREATISE ON DISEASES OF THE EYE. First American Edition, with additions; illustrated with 216 engravings on wood, and six colored plates. Together with selections from the Test-types of Jaeger and Snellen. In one large and very handsome octavo volume of about 750 pages: extra cloth, $5 00; leather, $6 00. (*Lately Issued.*)

A work has long been wanting which should represent adequately and completely the present aspect of British Ophthalmology, and this want it has been the aim of Mr. Wells to supply. The favorable reception of his volume by the medical press is a guarantee that he has succeeded in his undertaking, and in reproducing the work in this country every effort has been made to render it in every way suited to the wants of the American practitioner. Such additions as seemed desirable have been introduced by the editor, Dr. I. Minis Hays, and the number of illustrations has been more than doubled. The importance of test-types as an aid to diagnosis is so universally acknowledged at the present day that it seemed essential to the completeness of the work that they should be added, and as the author recommends the use of those both of Jaeger and of Snellen for different purposes, selections have been made from each, so that the practitioner may have at command all the assistance necessary. The work is thus presented as in every way fitted to merit the confidence of the American profession.

In this respect the work before us is of much more service to the general practitioner than those heavy compilations which, in giving every person's views, too often neglect to specify those which are most in accordance with the author's opinions, or in general acceptance. We have no hesitation in recommending this treatise, as, on the whole, of all English works on the subject, the one best adapted to the wants of the general practitioner.—*Edinburgh Med. Journal*, March, 1870.

A treatise of rare merit. It is practical, comprehensive, and yet concise. Upon those subjects usually found difficult to the student, he has dwelt at length and entered into full explanation. After a careful perusal of its contents, we can unhesitatingly commend it to all who desire to consult a really good work on ophthalmic science. The American edition of Mr. Wells' treatise was superintended in its passage through the press by Dr. I. Minis Hays, who has added some notes of his own where it seemed desirable. He has also introduced more than one hundred new additional wood-cuts, and added selections from the test-types of Jaeger and of Snellen.—*Leavenworth Med. Herald*, Jan. 1870.

Without doubt, one of the best works upon the subject which has ever been published; it is complete on the subject of which it treats, and is a necessary work for every physician who attempts to treat diseases of the eye.—*Dominion Med. Journal*, Sept. 1869.

TOYNBEE (JOSEPH), F.R.S.,

Aural Surgeon to and Lecturer on Surgery at St. Mary's Hospital.

THE DISEASES OF THE EAR: their Nature, Diagnosis, and Treatment. With one hundred engravings on wood. Second American edition. In one very handsomely printed octavo volume of 440 pages; extra cloth, $4.

LAURENCE (JOHN Z.), F.R.C.S.,

Editor of the Ophthalmic Review, &c.

A HANDY-BOOK OF OPHTHALMIC SURGERY, for the use of Practitioners. Second Edition, revised and enlarged. With numerous illustrations. In one very handsome octavo volume, extra cloth, $3 00. (*Lately Issued.*)

This is, as its name suggests, a book for convenient reference rather than an exhaustive treatise, and as such it will be found very valuable to the general physician. It gives in very brief terms the symptoms and history of the various diseases of the eye, with just enough cases detailed to elucidate the text without confusing the reader. His chapter on examination of the eye is particularly good, and, it seems to us, better calculated to enlighten a novice than any similar instructions we have read.—*California Med. Gazette*, Jan. 1870.

For those, however, who must assume the care of diseases and injuries of the eye, and who are too much pressed for time to study the classic works on the subject, or those recently published by Stellwag, Wells, Bader, and others, Mr. Laurence will prove a safe and trustworthy guide. He has described in this edition those novelties which have secured the confidence of the profession since the appearance of his last. To the portion of the book devoted to a description of the optical defects of the eye, the publisher has given increased value by the addition of several pages of Snellen's test-types, so generally used to test the acuteness of vision, and which are difficult to obtain in this country. The volume has been considerably enlarged and improved by the revision and additions of its author, expressly for the American edition.—*Am. Journ. Med Sciences*, Jan. 1870.

LAWSON (GEORGE), F. R. C. S., Engl.,

Assistant Surgeon to the Royal London Ophthalmic Hospital, Moorfields, &c.

INJURIES OF THE EYE, ORBIT, AND EYELIDS: their Immediate and Remote Effects. With about one hundred illustrations. In one very handsome octavo volume, extra cloth, $3 50

It is an admirable practical book in the highest and best sense of the phrase.—*London Medical Times and Gazette*, May 18, 1867.

MORLAND (W. W.), M.D.

DISEASES OF THE URINARY ORGANS; a Compendium of their Diagnosis, Pathology, and Treatment. With illustrations In one large and handsome octavo volume of about 600 pages, extra cloth. $3 50.

BRYANT (THOMAS), F.R.C.S.

THE PRACTICE OF SURGERY. A Manual, with numerous engravings on wood. In one very handsome volume. (Preparing.)

WALES (PHILIP S.), M. D., Surgeon U. S. N.

MECHANICAL THERAPEUTICS: a Practical Treatise on Surgical Apparatus, Appliances, and Elementary Operations: embracing Minor Surgery, Bandaging, Orthopraxy, and the Treatment of Fractures and Dislocations. With six hundred and forty-two illustrations on wood. In one large and handsome octavo volume of about 700 pages: extra cloth, $5 75; leather, $6 75.

A Naval Medical Board directed to examine and report upon the merits of this volume, officially states that "it should in our opinion become a standard work in the hands of every naval surgeon;" and its adoption for use in both the Army and Navy of the United States is sufficient guarantee of its adaptation to the needs of every-day practice.

It is a unique specimen of literature in its way, in that, treating upon such a variety of subjects, it is as a whole so completely up to the wants of the student and the general practitioner. We have never seen any work of its kind that can compete with it in real utility and extensive adaptability. In conclusion, we would state, at the risk of reiteration, that this is the most comprehensive book on the subject that we have seen; is the best that can be placed in the hands of the student in need of a first book on surgery, and the most useful that can be named for such general practitioners who, without any special pretensions to surgery, are occasionally liable to treat surgical cases.—*N. Y. Med. Record*, March 2, 1868.

It is certainly the most complete and thorough work of its kind in the English language. Students and young practitioners of surgery will find it invaluable. It will prove especially useful to inexperienced country practitioners, who are continually required to take charge of surgical cases, under circumstances precluding them from the aid of experienced surgeons. —*Pacific Med. and Surg. Journal*, Feb. 1866.

The title of the above work is sufficiently indicative of its contents. We have not seen for a long time (in the English language) a treatise equal to this in extent, nor one which is better adapted to the wants of the general student and practitioner. It is not to the surgeon alone that this book belongs; the physician has frequent opportunities to fill an emergency by such knowledge as is here given. Every practitioner should make purchase of such a book—it will last him his lifetime.——*St. Louis Med. Reporter*, Feb. 1868.

THOMPSON (SIR HENRY),

Surgeon and Professor of Clinical Surgery to University College Hospital.

LECTURES ON DISEASES OF THE URINARY ORGANS. With illustrations on wood. In one neat octavo volume, extra cloth. $2 25.

These lectures stand the severe test. They are instructive without being tedious, and simple without being diffuse; and they include many of those practical hints so useful for the student, and even more valuable to the young practitioner.—*Edinburgh Med. Journal*, April, 1869.

Very few words of ours are necessary to recommend these lectures to the profession. There is no subject on which Sir Henry Thompson speaks with more authority than that in which he has specially gathered his laurels; in addition to this, the conversational style of instruction, which is retained in these printed lectures, gives them an attractiveness which a systematic treatise can never possess.—*London Medical Times and Gazette*, April 24, 1869.

BY THE SAME AUTHOR.

ON THE PATHOLOGY AND TREATMENT OF STRICTURE OF THE URETHRA AND URINARY FISTULÆ. With plates and wood-cuts. From the third and revised English edition. In one very handsome octavo volume, extra cloth, $3 50. (*Just Issued.*)

This classical work has so long been recognized as a standard authority on its perplexing subjects that it should be rendered accessible to the American profession. Having enjoyed the advantage of a revision at the hands of the author within a few months, it will be found to present his latest views and to be on a level with the most recent advances of surgical science.

With a work accepted as *the* authority upon the subjects of which it treats, an extended notice would be a work of supererogation. The simple announcement of another edition of a work so well and favorably known by the profession as this before us, must create a demand for it from those who would keep themselves well up in this department of surgery.—*St. Louis Med. Archives*, Feb. 1870.

TAYLOR (ALFRED S.), M. D.,

Lecturer on Med. Jurisp. and Chemistry in Guy's Hospital.

MEDICAL JURISPRUDENCE. Sixth American, from the eighth and revised London edition. With Notes and References to American Decisions, by CLEMENT B. PENROSE, of the Philadelphia Bar. In one large octavo volume of 776 pages, extra cloth, $4 50; leather, $5 50.

The sixth edition of this popular work comes to us in charge of a new editor, Mr. Penrose, of the Philadelphia bar, who has done much to render it useful, not only to the medical practitioners of this country, but to those of his own profession. Wisely retaining the references of the former American editor, Dr. Hartshorne, he has added many valuable notes of his own. The reputation of Dr. Taylor's work is so well established, that it needs no recommendation. He is now the highest living authority on all matters connected with forensic medicine, and every successive edition of his valuable work gives fresh assurance to his many admirers that he will continue to maintain his well-earned position. No one should, in fact, be without a text-book on the subject, as he does not know but that his next case may create for him an emergency for its use. To those who are not the fortunate possessors of a reliable, readable, interesting, and thoroughly practical work upon the subject, we would earnestly recommend this, as forming the best groundwork for all their future studies of the more elaborate treatises.—*New York Medical Record*, Feb. 15, 1867.

The present edition of this valuable manual is a great improvement on those which have preceded it. It makes thus by far the best guide-book in this department of medicine for students and the general practitioner in our language.—*Boston Med. and Surg. Journal*, Dec. 27, 1866.

BLANDFORD (G. FIELDING), M. D., F. R. C P.,

Lecturer on Psychological Medicine at the School of St. George's Hospital, &c.

INSANITY AND ITS TREATMENT: Lectures on the Treatment,

Medical and Legal, of Insane Patients. With a Summary of the Laws in force in the United States on the Confinement of the Insane. By ISAAC RAY, M. D. In one very handsome octavo volume of 471 pages: extra cloth, $3 25. (*Just Issued.*)

This volume is presented to meet the want, so frequently expressed, of a comprehensive treatise, in moderate compass, on the pathology, diagnosis, and treatment of insanity. To render it of more value to the practitioner in this country, Dr. Ray has added an appendix which affords information, not elsewhere to be found in so accessible a form, to physicians who may at any moment be called upon to take action in relation to patients.

It satisfies a want which must have been sorely felt by the busy general practitioners of this country. It takes the form of a manual of clinical description of the various forms of insanity, with a description of the mode of examining persons suspected of insanity. We call particular attention to this feature of the book, as giving it a unique value to the general practitioner. If we pass from theoretical considerations to descriptions of the varieties of insanity as actually seen in practice and the appropriate treatment for them, we find in Dr. Blandford's work a considerable advance over previous writings on the subject. His pictures of the various forms of mental disease are so clear and good that no reader can fail to be struck with their superiority to those given in ordinary manuals in the English language or (so far as our own reading extends) in any other.—*London Practitioner*, Feb. 1871.

Dr. Blandford's book well meets the prevailing deficiency, and is one of that class, unhappily too small, which prove a real blessing to the busy practitioner who has no other time for reading but those odd moments which he can catch in his brief intervals of leisure. It is so free from defects and is so fair a representation of the most approved views respecting insanity, that we find in it small occasion for criticism, and can do little more than commend it as an admirable manual for practical use. We end as we began, in heartily recommending it as a most useful and reliable guide to the general practitioner.—*Am. Journal Med. Sciences*, April, 1871.

WINSLOW (FORBES), M.D., D.C.L., &c.

ON OBSCURE DISEASES OF THE BRAIN AND DISORDERS

OF THE MIND; their incipient Symptoms, Pathology, Diagnosis, Treatment, and Prophylaxis. Second American, from the third and revised English edition. In one handsome octavo volume of nearly 600 pages, extra cloth. $4 25. (*Lately Issued.*)

A work which, like the present, will largely aid the practitioner in recognizing and arresting the first insidious advances of cerebral and mental disease, is one of immense practical value, and demands earnest attention and diligent study on the part of all who have embraced the medical profession, and have thereby undertaken responsibilities in which the welfare and happiness of individuals and families are largely involved. We shall therefore close this brief and necessarily very imperfect notice of Dr. Winslow's great and classical work by expressing our conviction that it is long since so important and beautifully written a volume has issued from the British medical press.—*Dublin Medical Press.*

It is the most interesting as well as valuable book that we have seen for a long time. It is truly fascinating.—*Am. Jour. Med. Sciences.*

LEA (HENRY C.).

SUPERSTITION AND FORCE: ESSAYS ON THE WAGER OF

LAW, THE WAGER OF BATTLE, THE ORDEAL, AND TORTURE. Second Edition, Enlarged. In one handsome volume royal 12mo. of nearly 500 pages; extra cloth, $2 75. (*Just Issued.*)

We know of no single work which contains, in so small a compass, so much illustrative of the strangest operations of the human mind. Foot-notes give the authority for each statement, showing vast research and wonderful industry. We advise our *confrères* to read this book and ponder its teachings.—*Chicago Med. Journal*, Aug. 1870.

As a work of curious inquiry on certain outlying points of obsolete law, "Superstition and Force" is one of the most remarkable books we have met with. —*London Athenæum*, Nov. 3, 1866.

He has thrown a great deal of light upon what must be regarded as one of the most instructive as well as interesting phases of human society and progress. . . The fulness and breadth with which he has carried out his comparative survey of this repulsive field of history [Torture], are such as to preclude our doing justice to the work within our present limits. But here, as throughout the volume, there will be found a wealth of illustration and a critical grasp of the philosophical import of facts which will render Mr. Lea's labors of sterling value to the historical student.—*London Saturday Review*, Oct. 8, 1870.

As a book of ready reference on the subject, it is of the highest value.—*Westminster Review*, Oct. 1867.

BY THE SAME AUTHOR. (*Just Issued.*)

STUDIES IN CHURCH HISTORY—THE RISE OF THE TEMPORAL POWER—BENEFIT OF CLERGY—EXCOMMUNICATION.

In one large royal 12mo. volume of 516 pp. extra cloth. $2 75.

The story was never told more calmly or with greater learning or wiser thought. We doubt, indeed, if any other study of this field can be compared with this for clearness, accuracy, and power.—*Chicago Examiner*, Dec. 1870.

Mr. Lea's latest work, "Studies in Church History," fully sustains the promise of the first. It deals with three subjects—the Temporal Power, Benefit of Clergy, and Excommunication, the record of which has a peculiar importance for the English student, and is a chapter on Ancient Law likely to be regarded as final. We can hardly pass from our mention of such works as these—with which that on "Sacerdotal Celibacy" should be included—without noting the literary phenomenon that the head of one of the first American houses is also the writer of some of its most original books.—*London Athenæum*, Jan. 7, 1871.

Mr. Lea has done great honor to himself and this country by the admirable works he has written on ecclesiological and cognate subjects. We have already had occasion to commend his "Superstition and Force" and his "History of Sacerdotal Celibacy." The present volume is fully as admirable in its method of dealing with topics and in the thoroughness—a quality so frequently lacking in American authors—with which they are investigated.—*N. Y. Journal of Psychol. Medicine*, July, 1870.

INDEX TO CATALOGUE.

	PAGE
American Journal of the Medical Sciences	1
Abstract, Half-Yearly, of the Med Sciences	3
Anatomical Atlas, by Smith and Horner	6
Ashton on the Rectum and Anus	28
Attfield's Chemistry	10
Ashwell on Diseases of Females	22
Ashhurst's Surgery	27
Barnes on Diseases of Women	22
Bryant's Practical Surgery	29
Blandford on Insanity	31
Basham on Renal Diseases	18
Brinton on the Stomach	15
Bigelow on the Hip	28
Barclay s Medical Diagnosis	14
Barlow's Practice of Medicine	15
Bowman's (John E.) Practical Chemistry	10
Bowman's (John E.) Medical Chemistry	10
Brande & Taylor's Chemistry	11
Buckler on Bronchitis	17
Bucknill and Tuke on Insanity	14
Bumstead on Venereal	19
Bumstead and Cullerier's Atlas of Venereal	19
Carpenter's Human Physiology	8
Carpenter's Comparative Physiology	8
Carpenter on the Use and Abuse of Alcohol	13
Carson's Synopsis of Materia Medica	13
Chambers on the Indigestions	16
Chambers's Restorative Medicine	16
Christison and Griffith's Dispensatory	13
Churchill's System of Midwifery	25
Churchill on Puerperal Fever	22
Condie on Diseases of Children	21
Cooper's (B. B.) Lectures on Surgery	26
Cullerier's Atlas of Venereal Diseases	19
Cyclopedia of Practical Medicine	14
Dalton's Human Physiology	9
De Jongh on Cod-Liver Oil	13
Dewees's System of Midwifery	25
Dewees on Diseases of Females	22
Dewees on Diseases of Children	21
Druitt's Modern Surgery	28
Dunglison's Medical Dictionary	4
Dunglison's Human Physiology	9
Dunglison on New Remedies	13
Ellis's Medical Formulary, by Smith	13
Erichsen's System of Surgery	27
Erichsen on Nervous Injuries	27
Flint on Respiratory Organs	17
Flint on the Heart	17
Flint's Practice of Medicine	15
Fownes's Elementary Chemistry	11
Fuller on the Lungs, &c.	16
Green's Pathology and Morbid Anatomy	14
Gibson's Surgery	26
Gluge's Pathological Histology, by Leidy	14
Graham's Elements of Chemistry	10
Gray's Anatomy	6
Griffith's (R. E.) Universal Formulary	12
Gross on Foreign Bodies in Air-Passages	26
Gross's Principles and Practice of Surgery	26
Gross's Pathological Anatomy	14
Guersant on Surgical Diseases of Children	21
Hartshorne's Essentials of Medicine	16
Hartshorne's Conspectus of the Medical Sciences	5
Hamilton on Dislocations and Fractures	28
Heath's Practical Anatomy	7
Hoblyn's Medical Dictionary	4
Hodge on Women	23
Hodge's Obstetrics	24
Hodges' Practical Dissections	6
Holland's Medical Notes and Reflections	14
Horner's Anatomy and Histology	7
Hudson on Fevers,	18
Hill on Venereal Diseases	19
Hillier's Handbook of Skin Diseases	20
Jones and Sieveking's Pathological Anatomy	14
Jones (C. Handfield) on Nervous Disorders	18
Kirkes' Physiology	8
Knapp's Chemical Technology	10
Lea's Superstition and Force	31
Lea's Studies in Church History	31
Lallemand and Wilson on Spermatorrhœa	19
La Roche on Yellow Fever	14
La Roche on Pneumonia, &c.	17
Laurence and Moon's Ophthalmic Surgery	29
Lawson on the Eye	29
Laycock on Medical Observation	14
Lehmann's Physiological Chemistry, 2 vols.	9
Lehmann's Chemical Physiology	9
Ludlow's Manual of Examinations	5
Lyons on Fever	18
Maclise's Surgical Anatomy	7
Marshall's Physiology	8
Medical News and Library	2
Meigs's Obstetrics, the Science and the Art	25
Meigs's Lectures on Diseases of Women	23
Meigs on Puerperal Fever	23
Miller's Practice of Surgery	28
Miller's Principles of Surgery	26
Montgomery on Pregnancy	25
Morland on Urinary Organs	29
Morland on Uræmia	18
Neill and Smith's Compendium of Med. Science	5
Neligan's Atlas of Diseases of the Skin	20
Neligan on Diseases of the Skin	20
Odling's Practical Chemistry	10
Pavy on Digestion	15
Prize Essays on Consumption	17
Parrish's Practical Pharmacy	12
Pirrie's System of Surgery	27
Pereira's Mat. Medica and Therapeutics, abridged	13
Quain and Sharpey's Anatomy, by Leidy	6
Ranking's Abstract	3
Radcliff and others on the Nerves, &c.	18
Roberts on Urinary Diseases	18
Ramsbotham on Parturition	25
Rigby's Midwifery	25
Rokitansky's Pathological Anatomy	14
Royle's Materia Medica and Therapeutics	13
Salter on Asthma	17
Swayne's Obstetric Aphorisms	24
Sargent's Minor Surgery	28
Sharpey and Quain's Anatomy, by Leidy	6
Simon's General Pathology	14
Skey's Operative Surgery	26
Slade on Diphtheria	18
Smith (J. L.) on Children	21
Smith (H. H.) and Horner's Anatomical Atlas	6
Smith (Edward) on Consumption	17
Smith on Wasting Diseases of Children	21
Solly on Anatomy and Diseases of the Brain	14
Stillé's Therapeutics	12
Tanner's Manual of Clinical Medicine	5
Tanner on Pregnancy	24
Taylor's Medical Jurisprudence	30
Thomas on Diseases of Females	22
Thompson on Urinary Organs	30
Thompson on Stricture	30
Todd and Bowman's Physiological Anatomy	9
Todd on Acute Diseases	15
Toynbee on the Ear	29
Wales on Surgical Operations	30
Walshe on the Heart	17
Watson's Practice of Physic	16
Wells on the Eye	29
West on Diseases of Females	23
West on Diseases of Children	21
West on Nervous Disorders of Children	21
West on Ulceration of Os Uteri	23
What to Observe in Medical Cases	14
Williams's Principles of Medicine	14
Williams on Consumption	17
Wilson's Human Anatomy	7
Wilson on Diseases of the Skin	20
Wilson's Plates on Diseases of the Skin	20
Wilson's Handbook of Cutaneous Medicine	20
Wilson on Spermatorrhœa	19
Winslow on Brain and Mind	31

LANE MEDICAL LIBRARY

To avoid fine, this book should be returned on or before the date last stamped below.

P45 Smith, J.L.
S65 Diseases of infancy and
1872 childhood. 16648

NAME DATE DUE